

**[B16 ENG 1101]**  
I/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**ENGLISH**  
MODEL QUESTION PAPER  
(Common to all branches)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. a) Write an Essay on **One** of the following. (7M)
- i. Pros and cons of Internet
  - ii. Terrorism, a social evil
- b) Correct any **Five** of the following sentences. (5M)
- i. The machineries were expensive.
  - ii. Suppose, if you arrive late, you will miss the show.
  - iii. Choose the best of the two options.
  - iv. I enjoyed during the holidays.
  - v. I have seen him yesterday.
  - vi. The teacher gave us many advices.
- c) Use the appropriate articles in the given blanks. (2M)
- i. He speaks ..... English very well.
  - ii. I saw.....movie last night.
  - iii. Did you get married after leaving .....university?
  - iv. I was at.....train station when you called me.
2. a) Write a report on **One** of the following. (7M)
- i. Write a feasibility report for setting up a Water / Power Unit at your campus.
  - ii. Write a report on Educational Tour
- b) Write one word substitutions to any **Four** of the following and write sentences by using them. (5M)
- i. Language which is confusing and unintelligible.
  - ii. One who prepares plans for buildings.
  - iii. A great lover of books
  - iv. A person in charge of a museum
  - v. A man who thinks only for himself
  - vi. One who kills animals and sells their flesh
- c) Write appropriate quantifiers for each sentence (Some, few, much, lesser, a little, less). (2M)
- i. There were ..... at the college last year
  - ii. The project is ..... complicated than the last one

- iii. I have to buy .....pairs of blue and black jeans soon.
- iv. How .....cash do you need to purchase this CD player

3. a) Write a letter on **One** of the following. (8M)
- i. Write a letter to a renowned person, requesting him to be the Chief Guest for the cultural festival of your college.
  - ii. Write a letter to the editor about the problem of brain drain.
- b) Identify the types of the following sentences and write a similar sentence for each type. (4M)
- i. Oh, what a beautiful morning!
  - ii. Eat your supper.
  - iii. Today is my birthday.
  - iv. What gifts did you receive for your birthday?
- c) Re-write the sentences by using Gerunds, to-infinitives or plain infinitive forms. (2M)
- i. She is good at..... (dance).
  - ii. He is crazy about..... (sing).
  - iii. He'd like..... (fly) an aeroplane.
  - iv. I enjoy..... (write) picture postcards.
4. a) Draft an E-Mail to your friend about your career plans. (8M)
- b) Punctuate the following sentences taken from the text correctly. (4M)
- i. Sunil Sharma is Documentation Development Manager at Cerner Corporation one of the world's largest medical software developers
  - ii. As part of his job Sunil writes web-based content for Cerner
  - iii. One type of website that Cerner develops is marketed to health facilities for use by doctors nurses hospital administrators and patients
  - iv. This explains the communication challenge that Sunil faces. Cerner's end user is diverse consisting of lay readers and high-tech specialists
- c) Pick the right synonyms of the following words. (2M)
- i. Euphoria
    - a) Sober b) High spirits c) Mean d) Feeble
  - ii. Vicious
    - a)cruel b)kind c)splendid d)dearest
  - iii. Remnant
    - a)horror b)whole sale c)left over d)energize
  - iv. Acclaim
    - a) praise b) blame c) honour d) criticism
5. a) Develop a paragraph (150words) based on the following hints. (7M)
- As the 11th President of India---- the Indian National Congress-----  
'people's president', he was-----. His contribution -----Bharat Ratna. During -  
-----in India. He is the -----India: 2020 and Ignited Minds.
- b) Fill in the blanks with the appropriate idioms from the box. (5M)
- (The cream of the crop, an arm and a leg, hand in glove, hue and cry, Eager beaver, shape up)
- i. Frank always tries to finish his work before everyone else. He is an\_\_\_\_\_.
  - ii. We chose the prettiest, best behaved puppy. She was certainly \_\_\_\_\_.
  - iii. If Madge doesn't\_\_\_\_\_, she could lose her job.

- iv. Our new office was very expensive. It cost\_\_\_\_\_.
- v. The two friends are \_\_\_\_\_ with each other.
- c) Pick the right antonyms of the following words. (2M)
- i. Awake
    - a)alive b) stir c) asleep d) truce
  - ii. Create
    - a) build b) beak c) deny d) refuse
  - iii. Emerge
    - a) abandon b) appear c) fall d) hide
  - iv. Warm
    - a) cold b) pleasant c) unkind d)indifferent
6. a) Draft a pamphlet on any Electronic home appliances/Places of tourists' interest/an Educational institution/ an exhibition. (8M)
- b) Fill in the blanks using the appropriate forms of verbs given in the brackets. (4M)
- i. The wind \_\_\_\_ furiously. (Blow)
  - ii. He \_\_\_\_ to his mother every week. (Write)
  - iii. In a fit of rage, she \_\_\_\_ up the letter. (Tear)
  - iv. We couldn't have \_\_\_\_\_ a better day for organizing the party. (Choose)
- c) Fill in the blanks with appropriate prepositions from the box (in , at, the, at, on,). (2M)
- i. They are staying at \_\_\_\_hotel
  - ii. That is \_\_\_\_ girl I told you about
  - iii. My birthday is\_\_\_\_ May
  - iv. We are going to see my parents \_\_\_\_the weekend
7. a) Present an argument in about 150 words on 'Women are not suitable to work in the industry.' Substantiate your argument with reasons. (7M)
- b) Read the following paragraph and answer the questions: (5M)

The study of history provides many benefits. First, we learn from the past. We may repeat mistakes, but, at least, we have the opportunity to avoid them. Second, history teaches us what questions to ask about the present. Contrary to some people's view, the study of history is not the memorization of names, dates, and places. It is the thoughtful examination of the forces that have shaped the courses of human life. We can examine events from the past and then draw inferences about current events. History teaches us about likely outcomes.

Another benefit of the study of history is the broad range of human experience which is covered. War and peace are certainly covered as are national and international affairs. However, matters of culture (art, literature, and music) are also included in historical study. Human nature is an important part of history: emotions like passion, greed, and insecurity have influenced the shaping of world affairs. Anyone who thinks that the study of history is boring has not really studied history.

- i. What is the main idea of this passage?
- ii. In the first paragraph, 'inferences' mean?
- iii. Which method of teaching history would the author of this passage support?
- iv. In the second paragraph, 'shaping of world affairs' Means.
- v. What is the conclusive thought of the author?

- c) Fill the blanks by using appropriate conjunctions (because, neither-nor, and, and) (2M)
- i. Receptionists must be able to relay information \_\_\_\_\_ pass messages accurately.
  - ii. Mary is a member of the Historical Society \_\_\_\_\_ the Literary Society.
  - iii. Susie \_\_\_\_\_ phoned \_\_\_\_\_ wrote after she left home.
  - iv. The committee rejected the proposal \_\_\_\_\_ they did not think it was practical.

8. a) Select appropriate words from the below word list to complete the following sentences. (6M)  
(popularity, interact, networking, revolutionized, overwhelmed, reputation)

- i. Sachin's \_\_\_\_\_ was evidence of the fact that he was a friendly and fun to be with.
- ii. \_\_\_\_\_ is the key to understanding the market better.
- iii. Leela was \_\_\_\_\_ with emotion at the award ceremony.
- iv. His failure to reach the meeting on time has not done any good to his \_\_\_\_\_.
- v. A tiny little box between the electric guitar and the amplifier \_\_\_\_\_ rock music.
- vi. Javed said 'We at DSIJ love to \_\_\_\_\_ with our readers and we have some special sections for all of you.

b) Write a conversation between two/ three friends who are discussing an idea for a business they would like to set up. (8M)

(or)

Write a conversation between two students discussing a social issue.

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[B16 ENG 1101]

**[B16 ENG 1102]**  
I/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**MATHEMATICS - I**  
MODEL QUESTION PAPER  
(Common to all branches)

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Solve the following. [ 7x2 = 14 marks]
- (a) Find the total derivative of  $x^2y$  with respect to  $x$  when  $x$  and  $y$  are connected by the relation  $x^2 + xy + y^2 = 1$
- (b) If the plane  $3x + 12y - 6z - 17 = 0$  touches the conicoid  $3x^2 - 6y^2 + 9z^2 + 17 = 0$  find the point of contact
- (c) Write the necessary conditions for  $f(x,y)$  to have a maximum or minimum at  $(a,b)$ .
- (d) Form the differential equation from the equation  $x = a \sin(\omega t + b)$
- (e) Solve  $(y^2 e^{xy^2} + 4x^3)dx + (2xye^{xy^2} - 3y^2)dy = 0$
- (f) Solve  $\frac{d^4y}{dx^4} + 2\frac{d^2y}{dx^2} + y = 0$
- (g) Express  $f(x) = \frac{x}{2}$  as a Fourier series in the interval  $-\pi < x < \pi$

2. (a) If  $U = \tan^{-1} \frac{x^3 + y^3}{x - y}$  and  $x U_x + y U_y = \sin 2U$ , prove that

$$x^2 U_{xx} + 2xy U_{xy} + y^2 U_{yy} = 2 \cos 3U \sin U$$

(b) If  $u = x^2 - 2y^2$ ;  $v = 2x^2 - y^2$  where,  $x = r \cos \theta$ ,  $y = r \sin \theta$

show that  $\frac{\partial(u,v)}{\partial(r,\theta)} = 6 r^3 \sin 2\theta$

3. (a) Expand  $x^2 y + 3y - 2$  in powers of  $(x - 1)$  and  $(y + 2)$  using Taylor's theorem.  
 (b) By using the method of differentiation under the integral sign

Prove that  $\int_0^\infty \frac{\tan^{-1}(ax)}{x(1+x^2)} dx = \frac{\pi}{2} \log(1+a) : a \geq 0$

4. (a) Solve  $\frac{dy}{dx} = y \tan x - y^2 \sec x$

(b) Solve  $\frac{dy}{dx} + \frac{y \cos x + \sin y + y}{\sin x + x \cos y + x} = 0$

5. (a) Find the orthogonal trajectories of the family of parabolas  $ay^2 = x^3$

- (b) If 30 % of radio active substance disappeared in 10 days, how long will it take for 90 % of the substance to disappear?

6. (a) Solve  $\frac{d^2 y}{dx^2} + 4y + 5y = -2 \cosh x$  given that  $y = 0$  and  $\frac{dy}{dx} = 1$  at  $x = 0$

(b) Solve  $\frac{d^2 y}{dx^2} + 4y = \tan 2x$ , by using method of variation of parameters.

7. (a) Solve  $x^2 \frac{d^2 y}{dx^2} - 2x \frac{dy}{dx} - 4y = x^2 + 2 \log x$

(b) Solve the simultaneous equations  $\frac{dx}{dt} + y = \sin t$ ,  $\frac{dy}{dt} + x = \cos t$ , given that  $x = 2$  and

$y = 0$  when  $t = 0$

8. (a) Find the Fourier series of  $f(x) = x - x^2$  in the interval  $-\pi < x < \pi$

(b) Find the half-range cosine series for  $f(x) = x$  in the interval  $0 < x < 2$

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[B16 ENG 1102]

**[B16 ENG 1103]**  
I/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**MATHEMATICS - II**  
MODEL QUESTION PAPER  
(Common to all branches)

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**

**All parts of a question must be answered at one place only**

1. Solve the following. [ 7x2 = 14 marks]
  - a) Find the value of  $\lambda$  for which the system of equations  $2x + y + 2z = 0$ ,  
 $x + y + 3z = 0$ ,  $4x + 3y + \lambda z = 0$  have a non-zero solution.
  - b) Define Hermitian matrix and give an example.
  - c) Write any two properties of Laplace transforms
  - d) Find the Laplace transform of unit step function
  - e) Find  $L^{-1}\left(\frac{s^2 - 3s + 4}{s^3}\right)$ .
  - f) Solve the difference equation  $u_{n+1} - 2u_n + 2u_{n-1} = 0$ .
  - g) Find the z-transform of  $n^2$ .
  
2. a) Find the rank of the matrix  $A = \begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}$  by reducing into normal form.  
  
b) Find the eigen values and eigen vectors of the matrix  $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ .
  
3. a) Verify Cayley-Hamilton theorem for the matrix  $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$  and use it to evaluate the matrix equation  $A^6 - 6A^5 + 9A^4 - 2A^3 - 12A^2 + 23A - 9I$ .

- b) If  $A = \begin{bmatrix} 0 & 1+2i \\ -1+2i & 0 \end{bmatrix}$  then show that  $(I-A)(I+A)^{-1}$  is a unitary matrix.
4. a) Reduce the quadratic form  $2xy + 2xz - 2yz$  to canonical form by an orthogonal transformation and discuss its nature.  
 b) Solve:  $x + 2y + 3z = 14$ ,  $2x + 3y + 4z = 20$ ,  $3x + 4y + z = 14$  by Gauss elimination method.
5. a) Find i)  $L\left\{\frac{\cos at - \cos bt}{t}\right\}$  ii)  $L\left\{\int_0^t e^{-t} \cos t dt\right\}$ .  
 b) Find the Laplace transform of the triangular wave function of period  $2a$  given by  
 $f(t) = t, 0 < t < a$   
 $= 2a - t, a < t < 2a$ .
6. a) Evaluate: i)  $L^{-1}\left\{\log\left(\frac{s+1}{s-1}\right)\right\}$  ii)  $L^{-1}\left\{\frac{3s}{s^2 + 2s - 8}\right\}$ .  
 b) State Convolution theorem and use it to evaluate  $L^{-1}\left\{\frac{1}{(s-2)(s+2)^2}\right\}$ .
7. a) Solve the difference equation  $y_{n+2} - 6y_{n+1} + 8y_n = 2^n$ .  
 b) Use z-transforms to solve  $y_{n+2} - 5y_{n+1} + 6y_n = 1$ , given  $y_0 = 0, y_1 = 1$ .
8. a) Find inverse Z-transform of  $\frac{z^2 + 2z}{(z+1)(z-1)^2}$  by the use of Partial fractions.  
 b) Given  $Z(u_n) = \frac{2z^2 + 3z + 4}{(z-3)^3}; |z| > 3$ , find the values of  $u_1, u_2$  and  $u_3$ .

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[B16 ENG 1103]

**[B16 ENG 1104]**  
I/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**CHEMISTRY**  
MODEL QUESTION PAPER  
(Common to CIVIL, CSE, IT)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**

**All parts of a question must be answered at one place only**

1. Write a short answer to the following. [ 7x2 = 14 marks]
  - (a) What is hardness of water.
  - (b) How solids are classified?
  - (c) What are ceramics?
  - (d) What is the Galvanic corrosion?
  - (e) What do you mean by conducting polymers?
  - (f) Define cetane number?
  - (g) Write any two advantages of LPG as motor fuel.
2.
  - (a) Describe the ion exchange process of water softening
  - (b) Describe the steps involved in municipal water treatment.
3.
  - (a) Write the manufacture of Portland cement.
  - (b) Write the properties and applications of ceramics.
4.
  - (a) Give a detailed account on band theory of solids.
  - (b) Explain zone refining of solids with neat diagram.
5.
  - (a) What is corrosion ? Explain the theory of dry corrosion with examples.
  - (b) What is paint? Explain the constituents of paint.
6.
  - (a) Define polymerization. Explain the mechanism of addition polymerisation with suitable Examples.
  - (b) Write the preparation and properties of cellulose derivatives.
7.
  - (a) Describe the manufacture of coke by Otto- Hoffmann's process
  - (b) What is synthetic petrol? Explain Fischer Tropsch, method with a neat diagram.
8.
  - (a) Explain the desalination of water by reverse osmosis method.
  - (b) Explain the principles of Lubrication with neat diagram.

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**[B16 ENG 1104]**

**[B16 ENG 1105]**  
I/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**PHYSICS**  
MODEL QUESTION PAPER  
(Common ECE, EEE & Mechanical)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write a short answer to the following. [ 7x2 = 14 marks]
  - (a) Distinguish between heat and work.
  - (b) What is a cyclic process and how it can be represented ?
  - (c) What is Hall effect ?
  - (d) Explain the principle of super position.
  - (e) Explain the principle of light propagation in an optical fiber.
  - (f) Define magneto striction effect.
  - (g) State the uncertainty principle.
  
2.
  - (a) Distinguish between reversible and irreversible process. Mention the conditions of reversibility of a process (4M)
  - (b) State and prove the Carnot's theorem (7M)
  - (c) What is the efficiency of a Carnot engine operating between melting point and boiling Point of water under normal conditions. (3M)
  
3.
  - (a) State and Explain the Biot and Savart law. Using it, deduce an expression for the magnetic Induction along the axis of a circular current carrying coil. (10M)
  - (b) What are Maxwell's equations and explain their significance. (4M)
  
4.
  - (a) Define interference phenomena of light. (2M)
  - (b) Deduce the conditions for maxima and minima of monochromatic light reflected from a thin transparent film. (8M)
  - (c) Describe the characteristics of lasers. (4M)
  
5.
  - (a) Define numerical aperture of an optical fiber and what is its physical significance. (2M)
  - (b) Deduce an expression for the numerical aperture of a fiber (7M)
  - (c) Mention the important applications of ultra sonics (5M)

6. (a) What are matter waves and describe their properties . (3M)  
(b) Deduce the Schrodingers time independent wave equation. (8M)  
(c) Give a classification of materials based on the band theory of solids (3M)
7. (a) What are nano materials and describe the methods of characterizing the nano materials (6M)  
(b) Describe with neat figure, any one method of synthesis of nano materials. (8M)
8. Write about  
(a) Entropy and disorder (4M)  
(b) Requirements of any laser device (4M)  
(c) Piezoelectric method of producing ultrasonics (6M)

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**[B16 ENG 1105]**

**[B16 ENG 1106]**  
I/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**COMPUTER PROGRAMMING USING C & NUMERICAL METHODS**  
MODEL QUESTION PAPER  
(Common to CIVIL, CSE, IT)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

- 1 Write a short answer to the following. . [ 7x2 = 14 marks]
- a) What is recursion? Give an example.
  - b) Explain scope and extent of variables.
  - c) What are truncation and round off errors?
  - d) Distinguish between local and global variables.
  - e) Explain different bitwise operators?
  - f) Explain Euler's Method.
  - g) What is Interpolation?
- 2 a) Explain different types of operators in C.  
b) Write a program to check whether the given number is palindrome or not.
- 3 a) What is an array? Explain two dimensional array with an example?  
b) Write a C program to generate prime numbers less than the given number.
- 4 a) What is a Pointer? How is it initialized? What is the function of a pointer variable? What are its uses?  
b) What is a loop ?Explain general forms of all loop structures with suitable examples.
- 5 a) Explain the difference between call by reference & call by value?  
b)Write a program to sort an array of elements in ascending order?

6 a) Explain the following

i) Structure

ii) Accessing elements in structure

iii) Arrays of structures

b) Briefly explain file handling functions.

7 a) Use gauss elimination method to solve

$$2x+y+z=10, 3x+2y+3z=18, x+4y+9z=16$$

b) Given  $y' = y - x$ , where  $y(0) = 2$  find  $y(0.1)$  and  $y(0.2)$  using Runge-kutta fourth order method

8 a) Find the root of the following equation using Newton-Raphson method, correct the result upto 3 decimal places.

$$X^3 - 3X - 5 = 0.$$

b) Evaluate

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$\int x \sin(x) dx$  using Simpson's 1/3 rule.

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[B16 ENG 1106]

**[B16 ENG 1107]**  
I/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**ENGINEERING GRAPHICS**  
MODEL QUESTION PAPER  
(Common to ECE, EEE & Mechanical)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write a short answer to the following. . [ 7x2 = 14 marks]
- (a) What is an involute? Write its uses?
  - (b) Define Conics.
  - (c) What is an auxiliary plane? State its purpose?
  - (d) Define frustum of a solid.
  - (e) Define the term section plane.
  - (f) State methods of developments.
  - (g) Define isometric scale.
2. An inelastic string 145 mm long has its one end attached to the circumference of a circular disc of 40 mm diameter. Draw the curve traced out by the other end of the string, when it is completely wound around the disc, keeping the string always tight.
3. A line AB, of 80 mm long has its end A, 15 mm in front of VP and 20 mm above HP. The other end B is 40 mm above HP and 50 mm in front of VP. Draw the projections of the line and determine the inclinations of the line with HP and VP.
4. Draw a rhombus of diagonals 100 mm and 60 mm long, with the longer diagonal horizontal. The figure is the top view of a square of 100mm long diagonals, with a corner on the ground. Draw its front view and determine the angle which its surface makes with the ground.
5. A pentagonal pyramid, with base 30mm and height 80mm, rests on one edge of its base on HP. The highest point in the base is 30mm above HP. Draw its projections, when the axis is parallel to VP. Drawn another front view, on a reference line inclined at  $30^{\circ}$  to the edge on which it is resting, so that the base is visible.
6. A cone, base 75 mm diameter and axis 80 mm long is resting on its base on the H.P. it is cut by a section plane perpendicular to the V.P., inclined at  $45^{\circ}$  to the H.P. and cutting the axis at a point 35 mm from the apex. Draw its front view, sectional top view and true shape of the section.

7. A right regular hexagonal pyramid of 30 mm side of base and height of 70 mm stands with its base on HP. A through circular hole of 30 mm diameter is drilled through the pyramid such that the axis of the hole is perpendicular to VP and intersects the axis of the pyramid 20 mm above the base. Draw the development of the lateral surface of the pyramid showing the true shape of the holes formed on it.
  
8. A right circular cylinder 5cm diameter of base and 7cm height has its base in the HP. A right circular cone diameter of base 4cm and height 4cm rests centrally over the upper flat surface of the cylinder. Draw the isometric view of the above combination

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**[B16 ENG 1107]**

**[B16 ENG 1108]**  
I/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**HISTORY OF SCIENCE AND TECHNOLOGY**  
MODEL QUESTION PAPER  
(Common to CIVIL, CSE & IT)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write a short answer to the following. [ 7x2 = 14 marks]
  - a) Explain the terms Science and Technology.
  - b) Describe the role of Scientist in the society.
  - c) Science and Technology Policy resolutions.
  - d) Defense Spin-offs.
  - e) Biosensors.
  - f) Barriers of Technological change.
  - g) Types of Technology transfer.
2. Describe the roots of science and technology in ancient period in India.
3. Explain the salient features of new technology fund and programs aimed at technological self reliance.
4. Describe the achievements of Council of Scientific and Industrial Research.
5. Explain the salient features of Space program and INSAT services.
6. Explain the importance of Nuclear energy and describe the effects of nuclear explosion and India's safety measures.
7. Describe the importance of Ocean development and explain the marine research and capacity building.
8. What is Appropriate technology? Explain the criteria for selection of an appropriate technology.

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**[B16 ENG 1108]**

**[B16 ENG 1109]**  
I/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**PROFESSIONAL ETHICS AND MORAL VALUES**  
MODEL QUESTION PAPER  
(Common to ECE, EEE & Mechanical)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write a short answer to the following. [ 7x2 = 14 marks]
  - (a) Ethical Vision
  - (b) Profession and Professionalism
  - (c) Environmental Ethics
  - (d) Bhopal Gas Tragedy
  - (e) Gender discrimination
  - (f) Cyber Crimes
  - (g) Engineers as Managers
2. Discuss the scope and aim of Engineering Ethics.
3. Explain the role of Engineers in promoting ethical climate.
4. What are Values? Explain in detail the classification of human values.
5. Elucidate the moral responsibility of engineers towards safety and risk.
6. Define the concept of globalization and explain the role of MNCs in our country.
7. What are the functions of various sample codes of ethics?
8. Discuss the need to focus on professional ethics.

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**[B16 ENG 1109]**

[B16 ENG 1201]  
I/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**MATHEMATICS-III**  
MODEL QUESTION PAPER  
(Common to all branches)

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Solve the following. [ 7x2 = 14 marks]
- (a) Find the angle between the line  $\frac{x+1}{2} = \frac{y}{3} = \frac{z-3}{6}$  and the plane  $3x + y + z = 7$ .
- (b) Define right circular cylinder.
- (c) Change the integral  $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dx dy$  into polar coordinates.
- (d) Express  $\int_0^\pi \sqrt{\tan \theta} d\theta$  in terms of gamma function.
- (e) Evaluate  $\int_0^1 \int_0^{1-y} xy dx dy$  using Dirichlet's integral.
- (f) State Parseval's identity for Fourier transforms.
- (g) Find the Fourier cosine transform of  $f(x) = e^{-ax}$  ( $a > 0$ ).
2. (a) Find the image of the point (2, -1, 3) in the plane  $3x - 2y - z - 9 = 0$ .
- (b) Find the equation of the plane which passes through the point (3, -3, 1) and is perpendicular to the planes  $7x + y + 2z = 6$  and  $3x + 5y - 6z = 8$ .
3. (a) Prove that the three planes  $2x + y + z = 3$ ,  $x - y + 2z = 4$ ,  $x + z = 2$  form a triangular prism
- (b) Find the magnitude and equations of the shortest distance between the lines
- $$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z+3}{4} \text{ and } \frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$$
4. (a) Find the equation of the sphere having its centre on the plane  $4x - 5y - z = 3$

and passing through the circle  $x^2 + y^2 + z^2 - 2x - 3y + 4z + 8 = 0$ ,  $x - 2y + z = 8$ .

(b) Find the equation of the right circular cone generated by rotating the line

$$\frac{x}{1} = \frac{y}{2} = \frac{z}{3} \text{ about the line } \frac{x}{-1} = \frac{y}{1} = \frac{z}{2}.$$

5. (a) Evaluate the integral by changing the order of integration  $\int_0^3 \int_1^{\sqrt{4-y}} (x+y) dx dy$ .

(b) Find by double integration the area of the lemniscate  $r^2 = a^2 \cos 2\theta$ .

6. (a) Evaluate the integral  $\int_1^e \int_1^{\log y} \int_1^{e^x} \log z dz dx dy$ .

(b) Find the centroid of the area enclosed by the parabola  $y^2 = 4ax$ , the x-axis and its latus rectum.

7. (a) Express the function  $f(x) = \begin{cases} 1 & \text{for } |x| \leq 1 \\ 0 & \text{for } |x| > 1 \end{cases}$

as a Fourier integral. Hence evaluate  $\int_0^\infty \frac{\sin \lambda \cos \lambda x}{\lambda} d\lambda$ .

(b) Find the Fourier Sine transform of  $\frac{e^{-ax}}{x}$ .

8. (a) Find Fourier transform of  $f(x) = \begin{cases} 1 & \text{for } |x| \leq a \\ 0 & \text{for } |x| > a \end{cases}$ .

Hence evaluate  $\int_0^\infty \frac{\sin ax}{x} dx$ .

(a) Use Parseval's identity to show that  $\int_0^\infty \frac{dt}{(t^2+1)(t^2+4)} = \frac{\pi}{12}$ .

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[B16 ENG 1201]

**[B16 ENG 1202]**  
I/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**PHYSICS**  
MODEL QUESTION PAPER  
(Common to CIVIL, CSE, IT)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write a short answer to the following. [ 7x2 = 14 marks]
  - a) Distinguish between heat and work.
  - b) What is a cyclic process and how it can be represented ?
  - c) What is Hall effect ?
  - d) Explain the principle of super position.
  - e) Explain the principles of light propagation in an optical fiber.
  - f) Define magnetostriction effect.
  - g) State the uncertainty principle.
  
2.
  - (a) Distinguish between reversible and irreversible process. Mention the conditions of reversibility of a process (4)
  - (b) State and prove the Carnot's theorem (3)
  - (c) What is the efficiency of a Carnot engine operating between melting point and boiling Point of water under normal conditions. (7)
  
3.
  - (a) State and Explain the Biot and Savart law. Using it, deduce an expression for the magnetic Induction along the axis of a circular current carrying coil. (10)
  - (b) What are Maxwell's equations and explain their signature (4)
  
4.
  - (a) Define interference phenomena of light. (2)
  - (b) Deduce the conditions for maxima and minima of monochromatic light reflected from a Thin transparent (8)
  - (c) Describe the characteristics of lasers. (4)
  
5.
  - (a) Define numerical aperture of an optical fiber and what is its physical significance. (2)
  - (b) Deduce an expression for the numerical aperture of a fiber (7)
  - (c) Mention the important applications of ultrasonics (5)
  
6.
  - (a) What are matter waves and describe their properties . (3)
  - (b) Deduce the Schrodingers time independent wave equation. (8)

- (c) Give a classification of materials based on the band theory of solids (3)
7. (a) What are nano materials and describe the methods of characterizing the nano materials (6)  
(b) Describe with neat figure, any one method of synthesis the nano materials. (8)
8. Write about
- (a) Entropy and disorder (4)  
(b) Requirement of any laser device (4)  
(c) Piezoelectric method of producing ultrasonics (6)

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**[B16 ENG 1202]**

**[B16 ENG 1203]**  
I/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**CHEMISTRY**  
MODEL QUESTION PAPER  
(Common to ECE, EEE, Mechanical)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write a short answer to the following. [ 7x2 = 14 marks]
  - a) What is hardness of water.
  - b) How solids are classified?
  - c) What are ceramics?
  - d) What is the Galvanic corrosion?
  - e) What do you mean by conducting polymers?
  - f) Define cetane number?
  - g) Write any two advantages of LPG as motor fuel.
2. (a) Describe the ion exchange process of water softening  
(c) Describe the steps involved in municipal water treatment.
3. (a) Write the manufacture of Portland cement.  
(b) Write the properties and applications of ceramics.
4. (a) Give a detailed account on band theory of solids.  
(b) Explain zone refining of solids with neat diagram.
5. (a) What is corrosion ? Explain the theory of dry corrosion with examples.  
(b) What is paint? Explain the constituents of paint.
6. (a) Define polymerization. Explain the mechanism of addition polymerisation with suitable Examples.  
(b) Write the preparation and properties of cellulose derivatives
7. (a) Describe the manufacture of coke by Otto- Hoffmann's process  
(b) What is synthetic petrol? Explain Fischer Tropsch, method with a neat diagram.
8. (a) Explain the desalination of water by reverse osmosis method.  
(b) Explain the principles of Lubrication with neat diagram.

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**[B16 ENG 1203]**

**[B16 ENG 1204]**  
I/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**ENGINEERING GRAPHICS**  
MODEL QUESTION PAPER  
(Common to CIVIL, CSE, IT)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write a short answer to the following. [ 7x2 = 14 marks]
- a) What is an involute? Write its uses?
  - b) Define HT and VT.
  - c) What is an auxiliary plane? State its purpose?
  - d) Define frustum of a solid.
  - e) Define the term section plane.
  - f) State methods of developments.
  - g) Define isometric scale.
2. An inelastic string 145 mm long has its one end attached to the circumference of a circular disc of 40 mm diameter. Draw the curve traced out by the other end of the string, when it is completely wound around the disc, keeping the string always tight.
3. A line AB, of 80 mm long has its end A, 15 mm in front of VP and 20 mm above HP. The other end B is 40 mm above HP and 50 mm in front of VP. Draw the projections of the line and determine the inclinations of the line with HP and VP.
4. Draw a rhombus of diagonals 100 mm and 60 mm long, with the longer diagonal horizontal. The figure is the top view of a square of 100mm long diagonals, with a corner on the ground. Draw its front view and determine the angle which its surface makes with the ground.
5. A pentagonal pyramid, with base 30mm and height 80mm, rests on one edge of its base on HP. The highest point in the base is 30mm above HP. Draw its projections, when the axis is parallel to VP. Draw another front view, on a reference line inclined at  $30^{\circ}$  to the edge on which it is resting, so that the base is visible.
6. A cone, base 75 mm diameter and axis 80 mm long is resting on its base on the H.P. it is cut by a section plane perpendicular to the V.P., inclined at  $45^{\circ}$  to the H.P. and cutting the axis at a point 35 mm from the apex. Draw its front view, sectional top view and true shape of the section.
7. A right regular hexagonal pyramid of 30 mm side of base and height of 70 mm stands with its base on HP. A through circular hole of 30 mm diameter is drilled through the pyramid such that

the axis of the hole is perpendicular to VP and intersects the axis of the pyramid 20 above the base. Draw the development of the lateral surface of the pyramid showing the true shape of the holes formed on it.

8. A right circular cylinder 5cm diameter of base and 7cm height has its base in the HP. A right circular cone diameter of base 4cm and height 4cm rests centrally over the upper flat surface of the cylinder. Draw the isometric view of the above combination.

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**[B16 ENG 1204]**

**[B16 ENG 1205]**  
I/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**COMPUTER PROGRAMMING USING C & NUMERICAL METHODS**  
MODEL QUESTION PAPER  
(Common to ECE, EEE & Mechanical)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

- 1 Write a short answer to the following. [ 7x2 = 14 marks]
- a) What is recursion? Give an example.
  - b) Explain scope and extent of variables.
  - c) What are truncation and round off errors?
  - d) Distinguish between local and global variables.
  - e) Explain different bitwise operators?
  - f) Explain Euler's Method.
  - g) What is Interpolation?
- 2
- a) Explain different types of operators in C.
  - b) Write a program to check whether the given number is palindrome or not.
- 3
- a) What is an array? Explain two dimensional array with an example?
  - b) Write a C program to generate prime numbers less than the given number.
- 4
- a) What is a Pointer? How is it initialized? What is the function of a pointer variable? What are its uses?
  - b) What is a loop ?Explain general forms of all loop structures with suitable examples.
- 5
- a) Explain the difference between call by reference & call by value?
  - b) Write a program to sort an array of elements in ascending order?

6 a) Explain the following

i) Structure

ii) Accessing elements in structure

iii) Arrays of structures

b) Briefly explain file handling functions.

7 a) Use gauss elimination method to solve

$$2x+y+z=10, 3x+2y+3z=18, x+4y+9z=16$$

b) Given  $y' = y - x$ , where  $y(0) = 2$  find  $y(0.1)$  and  $y(0.2)$  using Runge-kutta fourth order method

8 a) Find the root of the following equation using Newton-Raphson method, correct the result upto 3 decimal places.

$$X^3 - 3X - 5 = 0.$$

b) Evaluate

2

$\int x \sin(x) dx$  using Simpson's rule.

-2

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[B16 ENG 1205]

**[B16 ENG 1206]**  
I/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**PROFESSIONAL ETHICS AND MORAL VALUES**  
MODEL QUESTION PAPER  
(Common to CIVIL, CSE, IT)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write a short answer to the following. [ 7x2 = 14 marks]
  - (a) Ethical Vision
  - (b) Profession and Professionalism
  - (c) Environmental Ethics
  - (d) Bhopal Gas Tragedy
  - (e) Gender discrimination
  - (f) Cyber Crimes
  - (g) Engineers as Managers
2. Discuss the scope and aim of Engineering Ethics.
3. Explain the role of Engineers in promoting ethical climate.
4. What are Values? Explain in detail the classification of human values.
5. Elucidate the moral responsibility of engineers towards safety and risk.
6. Define the concept of globalization and explain the role of MNCs in our country.
7. What are the functions of various sample codes of ethics?
8. Discuss the need to focus on professional ethics.

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**[B16 ENG 1206]**

**[B16 ENG 1207]**  
I/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**HISTORY OF SCIENCE AND TECHNOLOGY**  
MODEL QUESTION PAPER  
(Common to ECE, EEE, Mechanical)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**

**All parts of a question must be answered at one place only**

1. Write a short answer to the following. [ 7x2 = 14 marks]
  - a) Explain the terms Science and Technology.
  - b) Describe the role of Scientist in the society.
  - c) Science and Technology Policy resolutions.
  - d) Defense Spin-offs.
  - e) Biosensors.
  - f) Barriers of Technological change.
  - g) Types of Technology transfer.
2. Describe the roots of science and technology in ancient period in India.
3. Explain the salient features of new technology fund and programs aimed at technological self reliance.
4. Describe the achievements of Council of Scientific and Industrial Research.
5. Explain the salient features of Space program and INSAT services.
6. Explain the importance of Nuclear energy and describe the nuclear explosion and India's safety measures.
7. Describe the importance of Ocean development and explain the marine research and capacity building.
8. What is Appropriate technology? Explain the criteria for selection of an appropriate technology.

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**[B16 ENG 1207]**

**[B16 CE 1208]**  
I/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**BUILDING MATERIALS AND BUILDING CONSTRUCTION**  
MODEL QUESTION PAPER  
(Department Subject - CIVIL)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write a short answer to the following. [ 7x2 = 14 marks]
  - a) Differentiate between wet and dry process manufacturing of ordinary Portland cement.(OPC)
  - b) How do you diagnose defects in painting suggest remedies
  - c) What is bearing capacity of soil? What is its importance?
  - d) Draw neat sketch of dog-legged staircase and quarter landing staircase
  - e) what are differences between distemper and emulsion paint
  - f) Explain decay of timbers
  - g) Define scaffolding and mention its components parts
2.
  - a) Discuss various methods of storing cement in the field and in godowns
  - b) Define Farm Work and explain the different types of farm-work.
3.
  - a) Draw the cross section of a tree and indicate various details.
  - b) Explain the properties of glass. What are the uses of glass brick and sheet glass?
4.
  - a) Describe various types of Pile foundations with brief description and usual notations
  - b) Explain about concrete blocks and FAL-G blocks
5.
  - a) How concrete is graded as per I.S.code? List out the factors effecting choice of mix problems.
  - b) Draw the sketch of queen post truss with all details
6.
  - a) Discuss the importance of location of doors, windows and ventilators in a building.
  - b) Explain the chemistry of plastics. Enumerate the various uses of plastics in buildings.
7.
  - a) Bring out the importance of aluminum and PVC doors, Windows and ventilators in building construction.
  - b) Describe the constituents of varnishes and explain the uses of varnishes
8.
  - a) What is a step? Mention its different types
  - b) Write short note on Transporting, placing and vibrating of concrete.

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**[B16 CE 1208]**

**[B16 CS 1208]**  
I/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**PROBABILITY, STATISTICS & QUEUING THEORY**  
MODEL QUESTION PAPER  
(Department Subject-Common to CSE, IT)

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

- 1 Write a short answer to the following [ 7x2 = 14 marks]
- (a) State the limitations of axiomatic approach to probability.
  - (b) State the properties of distribution function.
  - (c) Show that  $E(aX + b) = aE(X) + b$ .
  - (d) Find the moment generating function of Poisson distribution
  - (e) Define rank correlation?
  - (f) Define Type-I-error and Type-II-error.
  - (g) What are the operating characteristics of a queuing model?
- 2 (a) State and prove addition theorem of probability for n events.
- (b) Three machines A, B and C produce respectively 50%, 30% and 20% of the total number of items of a factory. The percentage of defective output of these machines is 3%, 4% and 5%
- (i) If an item is selected at random, find the probability that the item is defective.
  - (ii) Suppose an item is selected at random and is found to be defective. Find the probability that it was produced by machine A.
- 3 (a) The diameter of an electric cable is assumed to be a continuous variate with p.d.f.  $f(x) = 6x(1-x)$ ,  $0 \leq x \leq 1$ . Verify that the above is p.d.f. Also find the mean and variance.
- (b) Let X be a random variable with the following probability distribution:
- |               |     |     |     |
|---------------|-----|-----|-----|
| x :           | -3  | 6   | 9   |
| P ( X = x ) : | 1/6 | 1/2 | 1/3 |
- Find  $E(X)$ ,  $E(X^2)$  and using the laws of expectation, evaluate  $E(2X+1)^2$
- 4 (a) Twenty identical coins each with probability  $P$  of showing heads are tossed. The probability of heads showing on 10 coins is same as that of heads showing on 11 coins. Find  $P$ .
- (b) X is a normal variate with mean 30 and standard deviation 5. Find the probability that (i)  $26 \leq X \leq 40$  (ii)  $X \geq 45$  (iii)  $|X - 30| > 5$

- 5 (a) Obtain the equations of two lines of regression for the following data. Also obtain the estimate of  $X$  for  $Y = 70$

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

- (b) Find the correlation coefficient for the following data:

x :	1	2	3	4	5	6	7	8	9	10
Y :	10	12	16	28	25	36	41	49	40	50

- 6 (a) A sample of 100 items, drawn from a universe with mean value 64 and standard deviation 3 has a mean value 63.5. Is the difference in means significant? What will be your inference if the sample has 200 items?

- (b) Determine a 95% confidence interval for the mean of a normal population with the Sample 145, 146, 142, 143

- 7 (a) A group of 10 boys fed on a diet A and another group of 8 boys fed on a different diet B recorded the following increase in weights.

Diet A	5	6	8	1	12	4	3	9	6	10	Kgs
Diet B	2	3	6	8	10	1	2	8			Kgs

Does it show the superiority of Diet A over that of Diet B

- (b) Theory predicts that the proportion of beans in four groups A, B, C, D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287, 118. Does the experiment support the theory?

- 8 (a) For  $\{(M/M/1):(\infty/FIFO)\}$  queuing model, in the steady state case, obtain the average queue length in terms of relevant parameters  $\lambda$  and  $\mu$ .

- (b) Arrivals at a telephone booth are considered to be Poisson with an average time of 12 min. between one arrival and the next. The length of phone call is assumed to be distributed exponentially with mean 4 min.

(a) Find the average number of persons waiting in the system.

(b) What is the probability that a person arriving at the booth will have to wait in the Queue?

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[B16 CS 1208]

**[B16 EC 1208]**  
I/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**ELECTRONIC DEVICES AND CIRCUITS**  
MODEL QUESTION PAPER  
(Department Subject-ECE)

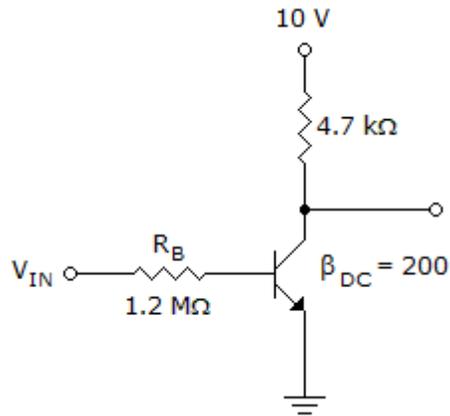
**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write a short answer to the following [ 7x2 = 14 marks]
  - a. What is meant by diffusion current in a semi-conductor?
  - b. A silicon diode has a saturation current of 7.5 pA at 300 °K. Calculate the saturation current at 330 ° K.
  - c. Define peak inverse voltage of a diode.
  - d. Draw the input and output characteristics of a transistor in CE configuration and mark the cutoff, saturation and active regions.
  - e. Compare JFET with BJT.
  - f. Define pinch-off voltage.
  - g. Draw the equivalent circuit of transistor for high frequencies
2.
  - a. Explain the current components in a PN junction diode and Derive the diode current equation.
  - b. Explain about avalanche and zener breakdowns.
3.
  - a. Explain about intrinsic and extrinsic semiconductors
  - b. write short note on (i) Hall effect (ii) continuity equation
4.
  - a. Explain the working of Bridge rectifier. Give the expressions for RMS current, PIV, ripple factor and efficiency.
  - b. A diode whose internal resistance is 20Ω is to supply power to a 100Ω load from 110V(rms) source supply. Calculate (i) peak load current (ii) the dc load current (iii) the ac load current (iv) the percentage regulation from no load to full load.
5.
  - a. Draw and explain the input and output characteristics of a transistor in CB configuration.
  - b. Determine the minimum value of  $I_B$  that produces saturation in the following figure.



6. a. Explain with the help of neat diagrams, the structure of an N-channel FET and its Volt-ampere characteristics.
- b. Explain the operating principle of enhancement mode MOSFET. How does it differ from depletion mode type?
7. a. Explain how FET acts as a voltage variable resistor.
- b. Show that if a FET is operated at sufficiently low drain voltage, it behaves as a resistance  $R$  given by  $R = R_O / [1 - (V_{GS} / V_P)^2]$  Where  $R_O$  is the channel resistance for zero gate voltage.
8. Write a short notes on
  - a. Photo transistor
  - b. Tunnel diode
  - c. Transition capacitance

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[B16 EC 1208]

**[B16 EE 1208]**  
I/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**CIRCUIT THEORY**  
MODEL QUESTION PAPER  
(Department Subject-EEE)

**Time: 3 Hrs.**

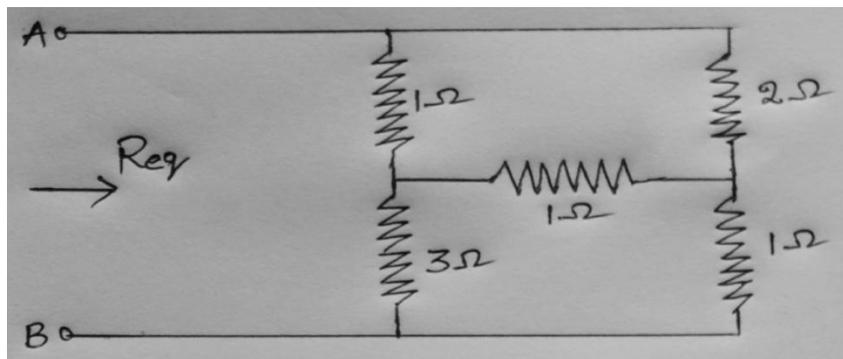
**Max. Marks: 70**

**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

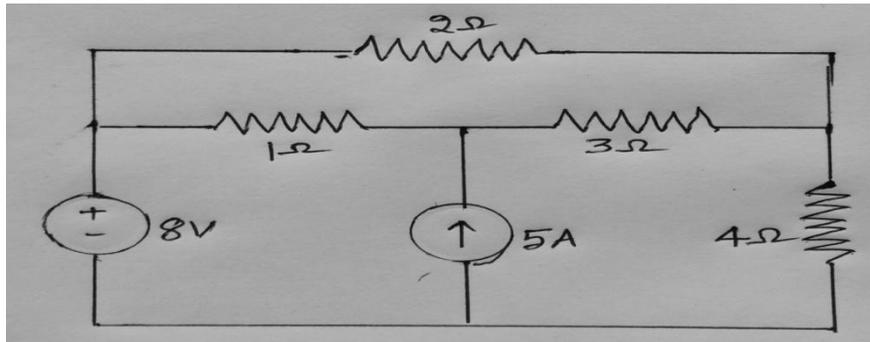
1. Write a short answer to the following [ 7x2 = 14 marks]

- a) What are the limitations of superposition theorem?
- b) Distinguish between Active and Passive elements.
- c) Draw the characteristics of an ideal voltage source.
- d) State Maximum power transfer theorem.
- e) Define MMF, Reluctance and Magnetic flux with respect to a magnetic circuit.
- f) State Faradays laws of Electromagnetic Induction.
- g) What is Self inductance?

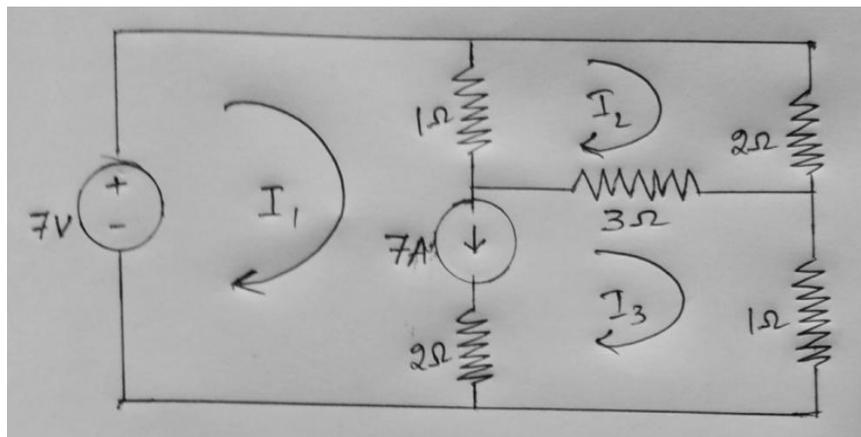
2. a) Find the equivalent resistance between the terminals A and B of the given network.



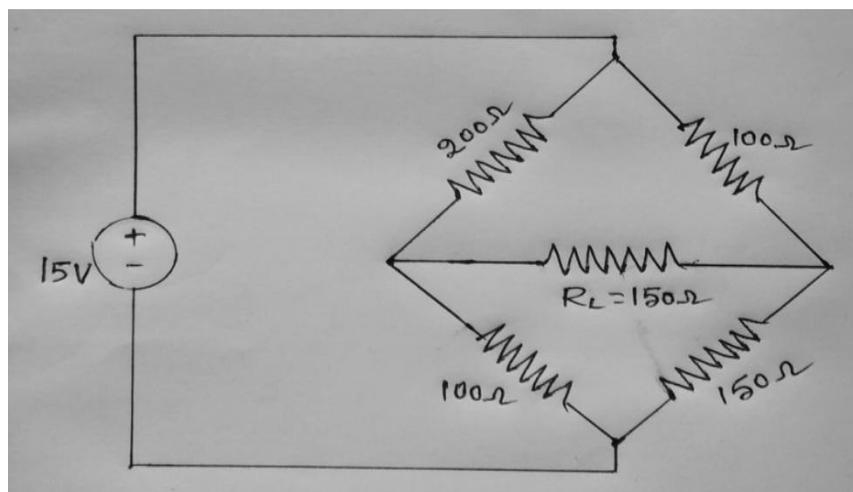
b) Using Nodal analysis find the currents and voltages in all the branches of the given network.



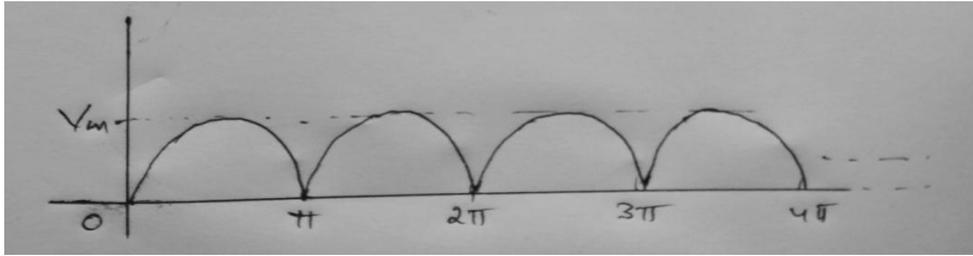
3.a) Find the mesh current  $I_1$  in the given circuit using mesh Analysis.



b) Find the current through the load resistance  $R_L$  in the given circuit using thevenin's theorem.



4. a) Define Average, RMS values of a periodic waveform. Obtain the Average and RMS values of the rectified sinusoidal waveform shown in figure.



- b) A series R-L-C circuit has  $R=10\text{ohms}$ ,  $L=0.01\text{H}$ ,  $C=100\mu\text{F}$ . Find the Resonant frequency, Quality factor and Band width of the circuit.
- 5.a) Explain (i) Instantaneous power (ii) Average power (iii) Complex power applied to AC circuits.
- b) The supply voltage to a circuit is  $v(t)=220\sqrt{2}\text{Sin}(wt)$  and the current drawn from it is  $i(t)=14.14\text{Sin}(wt - 45^\circ)$ . Find the Apparent, Active and Reactive powers.
6. a) Obtain the relation between Line and Phase quantities in a Star connected circuit.
- b) A 220V, 3-phase voltage is applied to a balanced delta connected 3-phase load of  $(15+j20)$  ohms per phase. Find (i) Phasor current in each line (ii) Power consumed per phase and (iii) Phasor sum of three line currents and comment on it.
7. a) Distinguish between Statically induced emf and Dynamically induced emf.
- b) An iron ring of cross-sectional area of  $10\text{ cm}^2$  is wound with a wire of 1500 turns has a saw cut of 3mm air gap. Calculate the magnetizing current required to produce a flux of 0.25mwb if the mean length of the magnetic path is 50cm and relative permeability of 470 and the leakage factor is 1.2.
8. a) What are the advantages of three phase circuits? (4M)
- b) Give the Analogy between Electric and Magnetic circuits. (4M)
- c) Explain about the measurement of power in three phase circuits. (6M)

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[B16 EE 1208]

**[B16 ME 1208]**  
I/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**METALLURGY AND MATERIALS ENGINEERING**  
MODEL QUESTION PAPER  
(Department Subject-Mechanical)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsorily.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write a short answer to the following. [ 7x2 = 14 marks]
- a) Define lattice parameters.
  - b) Define Gibbs phase rule
  - c) Explain peritectic transformation
  - d) Define heat treatment
  - e) Write a short note on isothermal transformation curves
  - f) Define smart materials.
  - g) Write short notes on fiber composites.
2.
  - a) Discuss various types of defects in crystals?
  - b) Explain different crystal structures and find the atomic packing factor for BCC, and FCC structures.
3.
  - a) With a neat sketch explain iron-carbon phase diagram and label all its phases.
  - b) What is a phase diagram? And discuss the construction of phase diagrams.
4.
  - a) What are the different steps to construct isothermal transformation curves for a eutectoid steel and explain it.
  - b) Explain the Austempering and Martempering process.
5.
  - a) Define composite materials? Discuss briefly various reinforcements in composite materials.
  - b) Mention advantages, limitations and applications of particle- reinforced composites.
6.
  - a) Explain the composition and application of the following.
    - i) Hadfield Steels, ii) Tool Steels, iii) High Speed Steels
  - b) What are different types of cast irons and explain how malleable cast iron is produced.
7.
  - a) What are the different case hardening methods and explain Carburizing process.
  - b) Explain flame and Induction hardening process with neat diagram.

- 8 Write a short note on any THREE of the following
- a) Nano materials
  - b) Invariant reactions
  - c) Applications of composites
  - d) Concept of Slip and Twinning
  - e) Precipitation Hardening

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**[B16 ME 1208]**

**[B16 ENG 2101]**  
II/IV B.Tech. DEGREE EXAMINATION  
First Semester.  
**MATHEMATICS-IV**  
MODEL QUESTION PAPER  
(Common to CIV, ECE, EEE & ME)

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

- 1 (a) Find a unit vector normal to the surface  $x^3 + y^3 + 3xyz = 3$  at the point  $(1, 2, -1)$ .  
(b) Show that  $\text{Curl}(\text{grad } \phi) = 0$ .  
(c) Show that  $\iiint_S \nabla r^2 \cdot d\bar{s} = 6V$ .  
(d) State two-dimensional Laplace equation in Cartesian coordinates. Define harmonic function.  
(e) Find the analytic function whose real part is  $x^3 - 3xy^2$ .  
(f) Evaluate  $\oint_C \frac{z^2 - z + 1}{(z - 2)} dz$  where C is the circle  $|z| = 1$ .  
(g) Find the nature and location of the singularities of the function  $\frac{1}{(z - 1)^3}$ .
- 2 (a) Find the directional derivative of  $f = x^2 - y^2 + 2z^2$  at the point  $P(1, 2, 3)$  in the direction of the line  $PQ$  where  $Q$  is the point  $(5, 0, 4)$ . Also calculate the magnitude of the maximum directional derivative.  
(b) Prove that  $\nabla^2 f(r) = f''(r) + \frac{2}{r} f'(r)$ .
- 3(a) Show that  $\bar{F} = (2xy + z^3)\bar{i} + x^2\bar{j} + 3xz^2\bar{k}$  is a conservative field. Find the potential function and hence the work done in moving a particle in this field from  $(1, -2, 1)$  to  $(3, 1, 4)$ .  
(b) Use Green's theorem to evaluate  $\oint_C [(3x - 8y^2)dx + (4y - 6xy)dy]$  where C is the boundary of the region described by  $x = 0, y = 0$  and  $x + y = 1$
- 4 (a) Evaluate  $\iiint_V \text{div } \bar{F} dv$  where  $\bar{F} = y\bar{i} + x\bar{j} + z^2\bar{k}$  over the cylindrical region bounded by  $x^2 + y^2 = 9, z = 0$  and  $z = 2$ .  
(b) Find components of the vector field  $z\bar{i} - z\bar{j} + y\bar{k}$  in cylindrical polar coordinates.
- 5 (a) Solve the equation  $py^3 + qx^2 = 0$  by the method of separation of variables.

(b) A tightly stretched string with fixed end points  $x = 0$  and  $x = l$  is initially at rest in its equilibrium position. If it is set vibrating by giving to each of its points a velocity  $\lambda x(l-x)$ , find the displacement of the string at any distance  $x$  from one end at any time  $t$ .

6 (a) If  $f(z)$  is a regular function of  $z$ , prove that  $\left( \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) |f(z)|^2 = 4|f'(z)|^2$ .

(b) Find the bi-linear transformation which maps the points  $z = 1, -1, \infty$  of the  $z$ -plane onto the points  $w = 1+i, 1-i, 1$  of the  $w$ -plane. Hence find the critical points and the invariant points of this transformation.

7(a) Evaluate  $\oint_C \frac{z^3 + z + 1}{z^2 - 7z + 2} dz$ , where  $C$  is the ellipse  $4x^2 + 9y^2 = 1$ .

(b) Find the Laurent's expansion of the function  $f(z) = \frac{1}{(1-z)(2-z)}$  valid for

(i)  $0 < |z-2| < 1$       (ii)  $|z-1| > 1$ .

8 (a) Evaluate  $\int_C \tan z dz$  where  $C$  is the circle  $|z| = 2$ .

(b) Use calculus of residues to evaluate  $\int_0^{2\pi} \frac{\cos 3\theta}{5 - 4\cos\theta} d\theta$ .

**[B16 ME 2101]**  
**II/IV B.Tech. I Semester Degree Examinations**  
**MECHANICS OF SOLIDS**  
**MODEL QUESTION PAPER**  
**Mechanical Engineering**

Time: 3 Hours

Max. Marks:70

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Question No.1 compulsory

Answer any FOUR questions from the remaining

All questions carry equal marks

All parts of a question must be answered at one place only

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1. Answer the following questions
  - (a) Define Poisson's ratio and young's modulus. [2 M]
  - (b) Define principal planes and principal stresses. [2 M]
  - (c) What are the assumptions made in the theory of simple bending? [2 M]
  - (d) Define bending moment and shear stress. [2 M]
  - (e) Sketch the distribution of shear stresses across the depth of the beam of T-section. [2 M]
  - (f) Define torsion and polar moment of inertia. [2 M]
  - (g) Name and sketch the different types of loads acting on beams. [2 M]
  
2.
  - (a) Define and derive the relation between elastic constants. [7 M]
  - (b) An axial pull of 35,000 N is acting on a bar consisting of three lengths 20 cm; 25 cm and 22 cm with diameters of 2 cm; 3 cm and 5 cm respectively, If the young's modulus is  $2.1 \times 10^5$  N/mm<sup>2</sup>. Determine stress in each section and total extension of the bar. [7 M]
  
3.
  - (a) A rectangular bar is subjected to two direct stresses ( $\sigma_x$  and  $\sigma_y$ ) in two mutually perpendicular directions. Derive the expression for normal stress and shear stress on an oblique plane which is inclined at an angle with the axis of minor stress. [7 M]
  - (b) At a point in a strained material, the principal stresses are 200 N/mm<sup>2</sup> (T) and 60 N/mm<sup>2</sup> (C). Determine the direction and magnitude in a plane inclined at 60° to the axis of major principal stress. What is the maximum intensity of shear stress in the material at the point? [7 M]
  
4.
  - (a) Explain different types of beams, supports and loads, carried by beams with neat sketches. [7 M]
  - (b) A cantilever of 10m length carries point loads of 20, 30 & 100 KN at 3, 6 & 9m from fixed end respectively. Draw SFD & BMD. [7 M]
  
5.
  - (a) Prove that the maximum shear stress in a circular section of a beam is 4/3 times the average shear stress. [7 M]
  - (b) A rectangular beam of 200mm deep and 300 mm wide is simply supported over a span of 8m. What uniformly distributed load per meter the beam may [7 M]

carry, if the bending stress is not exceeding  $120 \text{ N/mm}^2$ .

6. (a) A solid shaft of diameter 80mm is subjected to a twisting moment of 8 MN-mm and a bending moment of 5 MN-mm at a point. Determine (i) principal stress and (ii) Position of the plane on which they act. [7 M]
- (b) A hollow shaft of external diameter 120 mm transmits 300 KW power at 200 rpm. Determine the maximum internal diameter if the maximum stress in the shaft is not to exceed  $60 \text{ N/mm}^2$ . [7 M]
7. (a) Derive an expression for circumferential stress and longitudinal stress for a thin shell subjected to an internal pressure. [7 M]
- (b) A thin spherical shell of diameter 3 m and of thickness 6 cm contains a gas, if the tensile stress in the material is not to exceed by  $70 \text{ N/mm}^2$ , determine the internal pressure of the gas. [7 M]
- 8 A beam of constant cross-section 6 meters long is freely supported at its ends. It is loaded at points 2m from each end with load of 20000N. Find the ratio of the deflection under the center of the beam to the deflection at a point under one of the loads. [14 M]

**[B16 ME 2101]**

**[B16 ME 2102]**  
**II/IV B.Tech. I Semester Degree Examinations**  
**THERMODYNAMICS**  
**MODEL QUESTION PAPER**  
**Mechanical Engineering**

Time: 3 Hours

Max. Marks:70

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Question No.1 compulsory  
Answer any FOUR questions from the remaining  
All questions carry equal marks  
All parts of a question must be answered at one place only

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1. Answer the following questions
  - (a) Define Quasi-static process with neat sketch. [2 M]
  - (b) What is a free expansion process? [2 M]
  - (c) State the limitations of first law of thermodynamics. [2 M]
  - (d) What is principle of increase in entropy? [2 M]
  - (e) Define Compression ratio and its importance in Diesel cycle. [2 M]
  - (f) Define Available energy. [2 M]
  - (g) State the law of partial pressures. [2 M]
  
2.
  - (a) Explain the concept of continuum in detail. [7 M]
  - (b) Define energy and its types with an example. Also distinguish them by means of point and path functions. [7 M]
  
3.
  - (a) Derive a relation between P-V-T for an adiabatic non-flow process. [7 M]
  - (b) Prove that the formula  $T^b V^{a-b} e^{KT} = \text{Constant}$  for the adiabatic expansion of a gas if  $C_p = a + KT$  and  $C_v = b + KT$  where a, b, and k are constants and T in Kelvin. Calculate the workdone if 2 kg of gas originally occupying  $0.2 \text{ m}^3$  at 40 bar expands adiabatically until the temperature is  $260^\circ\text{C}$ , given that  $a=0.948, b=0.656$  and  $K=0.0001$ . [7 M]
  
4.
  - (a) Derive steady flow energy equation and also derive an equation for exit velocity of nozzle. [7 M]
  - (b) An axial flow compressor of a gas turbine plant receives air from atmosphere at a pressure 1 bar, temperature 300K and velocity 60 m/s. At the discharge of compressor the pressure is 5 bar and velocity is 100 m/s. The mass flow rate through the compressor is 20 kg/s. Assuming isentropic compression, calculate the power required to drive the compressor. Also calculate the inlet and outlet pipe diameters. Take density at inlet and outlet as  $100 \text{ kg/m}^3$  and  $500 \text{ kg / m}^3$  respectively. [7 M]
  
5.
  - (a) What are the various Causes of Irreversibility? Explain in detail any two causes. [7 M]
  - (b) A reversible heat engine operates between two reservoirs at a temperature of  $700^\circ\text{C}$  &  $50^\circ\text{C}$ . The engine drives a reversible refrigerator which operates [7 M]

between reservoirs at temperatures of  $50^{\circ}\text{C}$  and  $-25^{\circ}\text{C}$ . The heat transfer to the engine is 2500 KJ and the network output of the combined engine refrigerator plant is 400 KJ. Determine the heat transfer from the refrigerator and the net heat transfer to the reservoir at  $50^{\circ}\text{C}$ .

6. (a) Derive the air standard efficiency of Otto cycle with neat sketch. [7 M]  
(b) The compression ratio and expansion ratio of an oil engine working on the dual cycle are 9 and 5 respectively. The initial pressure and temperature of the air are 1 bar and  $30^{\circ}\text{C}$ . The heat liberated at constant pressure is twice the heat liberated at constant volume. The expansion and compression follow the law  $p v^{1.25} = \text{constant}$ . Determine pressure and temperature at all points, mean effective pressure, efficiency and power of the engine if working cycles per second are 8. Take bore diameter (D)=250mm, stroke length (L)= 400mm. [7 M]
7. (a) Derive availability functions for closed and open systems. [7 M]  
(b) Derive any two Maxwell's relations [7 M]
- 8 (a) Derive specific heats of gas mixtures. [7 M]  
(b) A mixture of ideal gases consists of 4kg of  $\text{N}_2$  and 6kg of  $\text{CO}_2$  at a pressure of 4bar and a temperature of  $20^{\circ}\text{C}$ . Find (i) the mole fraction of each constituent; (ii) the equivalent molecular weight of the mixture; (iii) the equivalent gas constant of the mixture; (iv) the partial pressures (v) the volume and density of the mixture; (vi) the  $C_p$  and  $C_v$  of the mixture. Take  $\gamma$  for  $\text{CO}_2$  as 1.286 and for  $\text{N}_2$  as 1.4. [7 M]

[B16 ME 2102]

**[B16 ME 2103]**  
**II/IV B.Tech. I Semester Degree Examinations**  
**MANUFACTURING PROCESS**  
**MODEL QUESTION PAPER**  
**Mechanical Engineering**

Time: 3 Hours

Max. Marks:70

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Question No.1 compulsory  
Answer any FOUR questions from the remaining  
All questions carry equal marks  
All parts of a question must be answered at one place only

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1. Answer the following questions
  - (a) What are different ingredients of moulding sand? [2 M]
  - (b) Write a short note on wire drawing. [2 M]
  - (c) List any four pattern materials. [2 M]
  - (d) What are electrode materials for resistance welding? [2 M]
  - (e) Explain about 2-high rolling mill [2 M]
  - (f) Define brazing and soldering. [2 M]
  - (g) Classify forging process. [2 M]
2.
  - (a) List out various pattern allowance. Discuss any four [7 M]
  - (b) Enumerate with neat sketches about various steps involved in making investment casting. [7 M]
3.
  - (a) Explain various properties of moulding sand. [7 M]
  - (b) Explain various steps involved in shell moulding process with sketches. [7 M]
4.
  - (a) Describe the principle of rolling. Write the various kinds of rolling mills along with their applications. [7 M]
  - (b) What is extrusion? Explain the process with the help of a neat sketch. [7 M]
5.
  - (a) What is forging? Explain various forging processes with the help of neat sketches. [7 M]
  - (b) With the help of neat sketch explain the working of (i) embossing; (ii) coining; (iii) stretch forming. [7 M]
6.
  - (a) Define resistance welding and briefly discuss the variables influence the same. [7 M]
  - (b) How natural, oxidizing and reducing flames are obtained in welding torch? Draw their sketches. [7 M]
7.
  - (a) Explain in detail about gas metal arc welding process with neat sketch. [7 M]
  - (b) Explain the terms (i) friction welding; (ii) explosive welding; (iii) diffusion welding. [7 M]
8. (a) Write a short note on any three of the following (i) Hot & Cold working; (ii) Pattern allowances; (iii) any four casting defect; (iv) hot spinning. [14 M]

**[B16 ME 2103]**

**[B16 ME 2104]**  
**II/IV B.Tech. I Semester Degree Examinations**  
**ENGINEERING MECHANICS**  
**MODEL QUESTION PAPER**  
**Mechanical Engineering**

Time: 3 Hours

Max. Marks:70

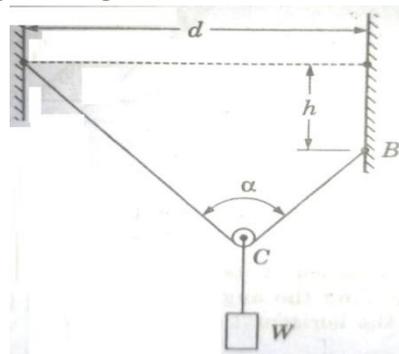
Question No.1 compulsory

Answer any FOUR questions from the remaining

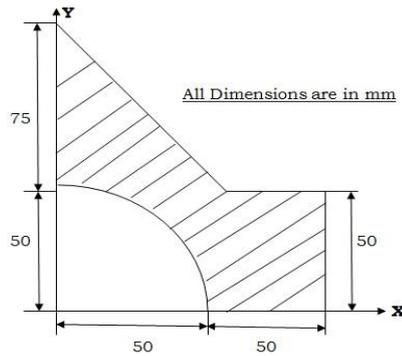
All questions carry equal marks

All parts of a question must be answered at one place only

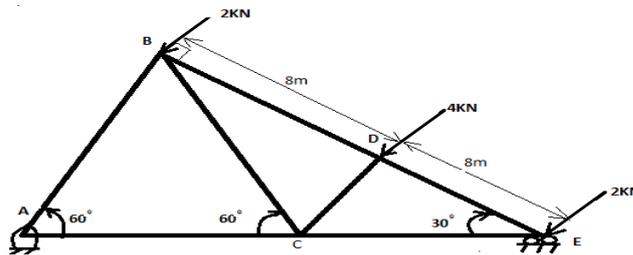
1. Answer the following questions
  - (a) Write the Theorems of Pappus. [2 M]
  - (b) Define Time of Flight, Range and Maximum Height of a projectile. [2 M]
  - (c) Define plane truss. [2 M]
  - (d) Explain the terms kinematics and kinetics. [2 M]
  - (e) Write the laws of friction. [2 M]
  - (f) State Law of parallelogram Law of Forces. [2 M]
  - (g) What is freebody Diagram? [2 M]
2.
  - (a) State and prove Varignon's theorem. [7 M]
  - (b) Describe the procedure to find the resultant in concurrent force system, parallel force system and general force system. [7 M]
3. (a) A string ABC of length  $l$  carries a small pulley C from which a Load  $W$  is suspended. The string hangs between two vertical walls which are at a distance  $d$  apart. The end A is higher than the end B by height  $h$ . Find the position of equilibrium defined by the angle  $\alpha$ . Assume  $d=l/2$  and  $h=l/4$ . [7 M]



- (b) Derive the moment of inertia of Triangle about its centroidal axis and determine the moment of inertia about its base. [7 M]
4.
  - (a) Find the centroid of the area bounded between the line  $y = x$  and by the curve  $y = ax^2$  in the first quadrant. [7 M]
  - (b) Determine the M.I of the shaded area about centroidal x and y axis. [7 M]

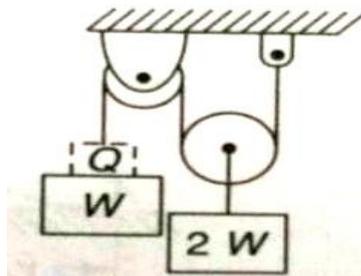


5. (a) Write the assumptions made for a perfect Truss. [4M]  
 (b) Determine the Forces in all the members if the Plane Truss shown below and Verify the forces in the members BD, CD and CE by method of Sections. [10 M]



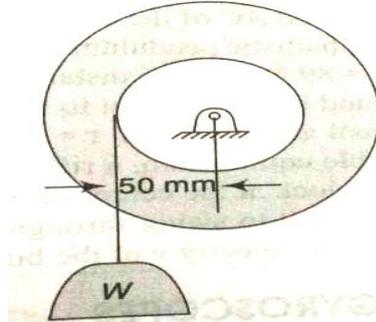
6. (a) Why coefficient of static friction is greater than the coefficient of kinetic friction? [4 M]  
 (b) A uniform ladder AB of length  $l = 20\text{m}$  and weight  $W$  is supported by the horizontal floor at A and by a vertical wall at B. It makes an angle  $45^\circ$  with the horizontal. If a man, whose weight is one half that of the ladder ascends the ladder, how much length  $x$  of the ladder he shall climb before the ladder slips. If a boy now stands on the end A of the ladder, what must be his least weight  $w$  so that the man may go to the top of the ladder? Assume  $\mu$  between Ladder and wall is  $1/3$ ;  $\mu$  between Ladder and Floor is  $1/2$ . [10 M]

7. (a) A stone is dropped into a well and falls vertically with constant acceleration due to gravity. The sound of impact of the stone on the bottom of the well is heard 6.5s after it is dropped. If the velocity of the sound is 336m/s, how deep is the well? [7 M]  
 (b) Weight  $W$  and  $2W$  are supported in a vertical plane by a string and pulleys arranged as shown in Fig. Find the magnitude of an additional weight  $Q$  applied on the left which will give a downward acceleration  $a = 0.1g$  to the weight  $W$ . [7 M]



- 8 (a) Derive the general equation of projectile motion. [7 M]

(b) A rotor of weight  $W = 1720 \text{ N}$  and radius of gyration  $k_0 = 100 \text{ mm}$  is mounted on a horizontal shaft and set in rotation by a falling weight  $W = 1720 \text{ N}$  as shown in Fig. If the system is released from rest, find the velocity of the block after it has fallen through a distance of  $3 \text{ m}$ . [7 M]



[B16 ME 2104]



4. Draw the following views for the simple eccentric assembly shown in Figure 2. [25 M]  
 (i) Half sectional front view; (ii) simple side view

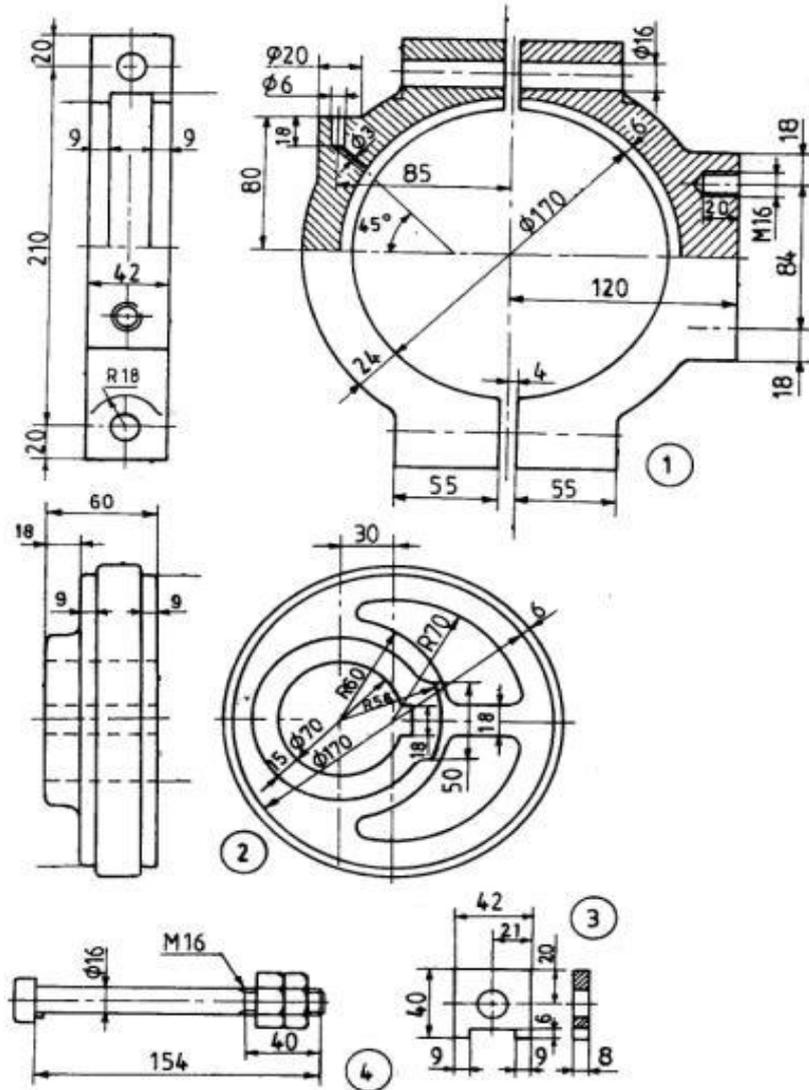


Figure 2. Parts of Simple Eccentric  
 Parts List

Part No.	Name	Material	Qty.
1.	Straps	Cast Iron	2
2.	Sheave	Cast Iron	1
3.	Shim	Brass	1
4.	Bolt & Nuts	Mild Steel	2

**[B16 ME 2201]**  
**II/IV B.Tech. II Semester Degree Examinations**  
**ADVANCED STRENGTH OF MATERIALS**  
**MODEL QUESTION PAPER**  
**Mechanical Engineering**

Time: 3 Hours

Max. Marks:70

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Question No.1 compulsory

Answer any FOUR questions from the remaining

All questions carry equal marks

All parts of a question must be answered at one place only

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1. Answer the following questions
  - (a) What are the different methods used to find out the slope and deflection at a section in a loaded Beam? [2 M]
  - (b) What do you mean by fixed beam? [2 M]
  - (c) Write the general three moment equation and explain the terms used in equation. [2 M]
  - (d) What are the assumptions made in the Euler's theory? [2 M]
  - (e) Define strut and column. [2 M]
  - (f) When the crane hook lifts a load heavier in weight where the maximum stress is induced in the section? What is its nature? [2 M]
  - (g) What is the disc of uniform strength? [2 M]
2. A fixed beam of span 6 meters carries two point loads, 150 KN and 240 KN at distances 2m and 4m from the left end. Find the end moments. Find also the maximum sagging moments. Draw S.F. and B.M. diagrams. [14M]
3. A continuous beam ABC consists of two spans AB and BC of lengths 6 m and 8 m. The span AB carries a point load of 120 KN at 4m from A, while the span BC carries a point load of 160 KN at 5 m from C. Find the moments and reactions at the supports. [14M]
4. (a) Derive the expressions for the crippling load for a long column when both ends are fixed. [7 M]  
(b) A hollow cylinder cast iron column is 4m long, both ends being fixed. Design the column to carry an axial load of 250 KN. Use Rankine's formula and adopt a factor of safety of 5. The internal diameter may be taken as 0.80 times the external diameter. Take  $F_e = 550 \text{ N/mm}^2$  and  $\alpha = 1/1600$ . [7 M]
5. (a) Explain effect of sinking in Fixed Beams. [7 M]  
(b) A metal column of external diameter 300 mm and thickness 20 mm carries a load of 400kn at an eccentricity of 50mm .determine the maximum and minimum stresses in the column if its length is 5cm and both the ends of the column are fixed. Take  $E= 95\text{GPa}$  [7 M]
6. (a) Derive an expression for circumferential stress and hoop stress for a thick [7 M]

cylinder subjected to an internal and external pressure.

- (b) The internal and external diameters of thick cylinders are 80 mm and 120 mm respectively, if it is subjected to an internal pressure of  $120 \text{ MN/m}^2$  and external pressure of  $40 \text{ MN/m}^2$ . Calculate the circumferential stress at the external and internal surfaces. [7 M]
7. A curved beam of rectangular cross-section of width 20 mm and depth 40 mm is subjected to pure bending moment of +600N-m. The mean radius of curvature is 50 mm. Plot the variation of stresses across the section. [14M]
- 8 (a) Derive the expression for the thickness of disc of uniform strength in terms of radius  $r$ . [7 M]
- (b) A disc uniform thickness having inner and outer diameters 100 mm and 400 mm respectively is rotating at 5000 rpm about its axis. The density of the material of the disc is  $7800 \text{ Kg/m}^3$  and Poisson's ratio is 0.28. Determine the stress variations along the radius of the disc. [7 M]

**[B16 ME 2201]**

**[B16 ME 2202]**  
**II/IV B.Tech. II Semester Degree Examinations**  
**THERMAL ENGINEERING**  
**MODEL QUESTION PAPER**  
**Mechanical Engineering**

Time: 3 Hours

Max. Marks:70

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Question No.1 compulsory

Answer any FOUR questions from the remaining

All questions carry equal marks

All parts of a question must be answered at one place only

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1. Answer the following questions
  - (a) Define Heat of superheat in steam using T-H diagram. [2 M]
  - (b) State various components of a simple vapour power cycle. [2 M]
  - (c) What are various types of nozzles? [2 M]
  - (d) What is compounding and state various types of compounding [2 M]
  - (e) State various pressures based on absolute zero pressure. [2 M]
  - (f) Necessity of steam boiler in a steam power plant. [2 M]
  - (g) Effects of air leakage in a condenser. [2 M]
  
2.
  - (a) Describe about a separating throttling calorimeter with neat sketch. [7 M]
  - (b) Determine the amount of heat which should be supplied to 2kg of water at 25<sup>0</sup> C to convert in to steam at 5bar and 0.9 dry. [7 M]
  
3.
  - (a) Explain Reheat vapour power cycle in detail with neat sketch. [7 M]
  - (b) In a single heater regenerative cycle the steam enters the turbine at 30bar and 400<sup>0</sup> C and the exhaust pressure is 0.1bar. The feed water heater is direct contact type which operates at 5bar. Find (i) the efficiency and the steam rate of the cycle; (ii) the increase in mean temperature of heat addition, efficiency and steam rate as compared to the basic rankine cycle (without regeneration); pump work may be neglected. [7 M]
  
4.
  - (a) Explain supersaturated flow in detail with the help of neat sketch. [7 M]
  - (b) A convergent-divergent nozzle is to be designed in which steam initially at 14 bar and 80<sup>0</sup> C of superheat is to be expanded down to a back pressure of 1.05 bar. Determine the necessary throat and exit diameter of the nozzle for a steam discharge of 500 kg/hour, assuming that the expansion is in thermal equilibrium throughout and friction reheat amounting to 12% of the total isentropic enthalpy drop to be effective in the divergent part of the nozzle. [7 M]
  
5.
  - (a) State various differences between impulse and reaction turbines. [7 M]
  - (b) The following particulars relate to a two row velocity compounded impulse wheel. Steam velocity at nozzle outlet is 650 m/s. Mean blade velocity is 125 m/s. Nozzle outlet angle is 16<sup>0</sup>. Outlet angles of 1<sup>st</sup> moving blade, fixed guide blade and 2<sup>nd</sup> row of moving blades are 18<sup>0</sup>, 22<sup>0</sup> & 36<sup>0</sup> respectively. Steam flow [7 M]

is 2.5kg/sec. The ratio of the relative velocity at outlet to that at inlet is 0.84 for all blades. Determine axial thrust on the blades, power developed and efficiency of the wheel.

6. (a) Explain with neat sketch any one surface condenser. [7 M]  
(b) During a trial on a steam condenser, the following observations were recorded: Condenser vacuum - 680 mm of Hg, Barometer reading-764mm of Hg, Mean condenser temperature- 36.2° c, Hot well temperature-30°c, Condensate formed per hour- 1780Kg, Circulating cooling water inlet temperature - 20°c, Circulating cooling water outlet temperature 32°c, Quantity of cooling water - 1250Kg/min. Determine: [7 M]  
(1) Condenser vacuum corrected to standard barometer  
(2) Vacuum efficiency.  
(3) Condenser efficiency.  
(4) Condition of steam entering the condenser.  
(5) Mass of air present per kg of condensed steam.
7. (a) Explain Babcock & Wilcox boiler with neat sketch. [7 M]  
(b) Explain in detail with neat sketch any one accessories and mounting. [7 M]
- 8 (a) Explain pressure-velocity compounding in steam turbines [7 M]  
(b) Sketch the isobaric, throttling, isentropic and isothermal processes [7 M] individually on Mollier chart.

**[B16 ME 2202]**

**[B16 ME 2203]**  
**II/IV B.Tech. II Semester Degree Examinations**  
**METAL CUTTING & MACHINE TOOLS**  
**Mechanical Engineering**

Time: 3 Hours

Max. Marks:70

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Question No.1 compulsory  
Answer any FOUR questions from the remaining  
All questions carry equal marks  
All parts of a question must be answered at one place only

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1. Answer the following questions
  - (a) What are the methods of indexing? [2 M]
  - (b) Enumerate the methods of taper turning in lathe. [2 M]
  - (c) What are the four important characteristics of materials used for cutting tools? [2 M]
  - (d) What are the operations which can be performed using planer? [2 M]
  - (e) What is built up edge? [2 M]
  - (f) Differentiate drilling from boring. [2 M]
  - (g) State the advantages of broaching. [2 M]
  
2.
  - (a) Explain the different types of chip formation and their effects on machining. [7 M]
  - (b) A steel tube 40 mm outside diameter is turned on a lathe. The following data was obtained: Rake angle =  $22^\circ$ ; Cutting speed = 18m/min; Feed = 0.2 mm/rev; Cutting force =  $180 \text{ kgf} \times 9.81 \text{ N}$ ; Feed force =  $60 \text{ kgf} \times 9.81 \text{ N}$ ; Length of continuous chip in one direction = 50 mm.  
Determine: (i) Chip thickness ratio; (ii) chip thickness; (iii) Shear plane angle; (iv) velocity of chip along tool face; (v) coefficient of friction. [7 M]
  
3.
  - (a) Draw the neat sketch of single point cutting tool and show the different parts and angles on it. [7 M]
  - (b) While machining a mild steel bar with HSS tool the cutting speed is 32 m/min, tool life is 50 min, if cutting speed is increase by 50%, how tool is affected? Take  $n = 0.2$ . [7 M]
  
4.
  - (a) Explain any one mechanism of a shaper. [7 M]
  - (b) Explain how thread cutting is performed on lathe with a neat sketch. [7 M]
  
5.
  - (a) Explain the construction and working principal of a radial drilling machine. [7 M]
  - (b) What is broaching. Explain the nomenclature of Pull broach. [7 M]
  
6.
  - (a) Describe the working of column and knee type milling machine. [7 M]
  - (b) Explain the indexing mechanism with a neat diagram. [7 M]
  
7.
  - (a) Explain the principle of operation of AJM. What are its applications? [7 M]

(b) What is EDM? Explain.

[7 M]

8 (a) Describe the galzing, loading and dressing of grinding wheels.

[14 M]

(b) Describe the working of cylindrical grinding machine.

**[B16 ME 2203]**

**[B16 ENG 2202]**  
**II/IV B.Tech. II Semester Degree Examinations**  
**ENGINEERING ECONOMICS**  
**MODEL QUESTION PAPER**  
**Mechanical Engineering**

Time: 3 Hours

Max. Marks:70

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Question No.1 compulsory  
Answer any FOUR questions from the remaining  
All questions carry equal marks  
All parts of a question must be answered at one place only

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1. Write short notes on the following  
(a) Economics [2 M]  
(b) Factors of production [2 M]  
(c) Oligopoly [2 M]  
(d) Inflation [2 M]  
(e) Job costing [2 M]  
(f) Types of public enterprises [2 M]  
(g) Depreciation [2 M]
2. State that law of demand. Why does the demand curve slope downwards? Are there any exceptions to it? [14 M]
3. What do you mean by mixed economy? Discuss the main features, merits and demerits of it. [14 M]
4. Describe the features of perfect competition. Illustrate the determination of price under perfect competition. [14 M]
5. What is a Business cycle? Describe the different phases of Business cycle. [14 M]
6. Illustrate Break-even analysis with the help of a diagram. What are its uses? [14 M]
7. What are the features of joint stock company? State its advantages and disadvantages? [14 M]
8. From the following Trial Balance, prepare Trading, P & L account and Balance sheet. [14 M]

**Trial Balance**

	Rs.		Rs.
Debtors	16,300	Capital	40,000
Cash	12,500	Sales	9,000
Furniture	10,000	Purchase returns	500
Purchases	3,500	Creditors	2,500
Sales returns	300		
Opening stock	2,000		

Rent and rates	750	
Insurance	350	
Wages	800	
Carriage	500	
Discount	650	
Oil and Fuel	550	
Drawings	2,900	
Carriage outwards	300	
Stationary	600	
	-----	-----
Total	52,000	52,000
	-----	-----

Closing stock value Rs.2,600.

**[B16 ENG 2202]**

**[B16 EE 2204]**  
**II/IV B.Tech. II Semester Degree Examinations**  
**BASIC ELECTRICAL & ELECTRONICS ENGINEERING**  
**MODEL QUESTION PAPER**  
**Mechanical Engineering**

Time: 3 Hours

Max. Marks:70

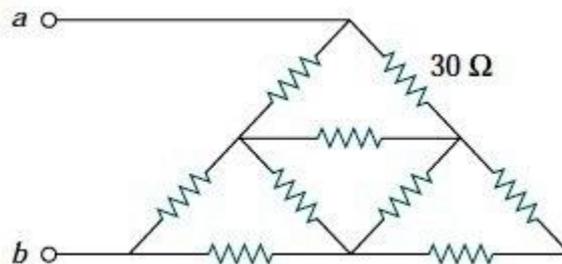
Question No.1 compulsory

Answer any FOUR questions from the remaining

All questions carry equal marks

All parts of a question must be answered at one place only

1.
  - (a) Define Ohm's Law and List out its Limitations [2 M]
  - (b) List the applications of DC Motors [2 M]
  - (c) Define regulation and efficiency of a transformer. [2 M]
  - (d) Define slip? What is the relationship between slip and speed of the induction motor? [2 M]
  - (e) List the differences between squirrel-cage and wound-rotor types of induction motor. [2 M]
  - (f) Why rating of the transformer is given in KVA? Explain. [2 M]
  - (g) Draw the circuit diagram symbols for p-n-p and n-p-n transistors. [2 M]
2.
  - (a) State and explain Kirchhoff's Laws with example. [7 M]
  - (b) Find the equivalent resistance  $R_{ab}$  for the circuit shown below. All the resistor values are  $30\Omega$ . [7 M]



3.
  - (a) Derive the torque equation of the DC motor. [7 M]
  - (b) An 8-pole, wave-connected armature has 600 conductors and is driven at 625 rev/min. If the flux per pole is 20 mWb, determine the generated E.M.F. [7 M]
4.
  - (a) Derive the EMF equation of a single phase transformer [7 M]
  - (b) A 200 KVA rated transformer has a full-load copper loss of 1.5 kW and an iron loss of 1 kW. Determine the transformer efficiency at full load & half load for 0.85 power factor. [7 M]
5.
  - (a) Draw and explain the slip-Torque Characteristics of Three phase Induction motor. [7 M]
  - (b) The frequency of the supply to the stator of a 6-pole induction motor is 50 [7 M]

Hz and the rotor frequency is 2 Hz. Determine (i) the slip, and (ii) the rotor speed in rev/min.

6. (a) Explain the procedure for finding Regulation of alternator by synchronous Impedance method. [7 M]  
(b) Explain the operation of Diode in Forward and reverse bias conditions and draw V-I characteristics. [7 M]
7. (a) Draw the circuit diagram of Bridge rectifier and explain its operation. [7 M]  
(b) Explain the operation of ZENER diode with neat Sketches. [7 M]
8. (a) Draw the circuit and explain the characteristics of Transistor in CE configuration. [7 M]  
(b) Explain how the transistor acts as an amplifier. [7 M]

**[B16 EE 2204]**

**[B16 ENG 2201]**  
II/IV B.Tech. DEGREE EXAMINATION  
Second Semester.  
**ENVIRONMENTAL STUDIES**  
MODEL QUESTION PAPER  
(Common to ECE,EEE& ME)

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsory.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only.**

1. Write short answers for the following:

- (a) Give the objectives of Environmental Studies
- (b) Define ecosystem
- (c) What are hotspots?
- (d) What is soil erosion?
- (e) What is sustainable development?
- (f) State the practical benefits of watershed management
- (g) What is biomagnifications movement?

2. Write about structure and function of forest ecosystem

3. Give an account of the various energy resources of India and their merits and demerits.

4. Give the bio-geographical classification of India and add a brief note on threats to biodiversity

5. Explain causes, effects and control measures of water pollution

6. Write a critical account of the effect of population growth on environment.

7. Give an account of rain water harvesting and watershed management with suitable example

8. Write short notes:

- a) Conflicts of water
- b) Effect of modern agriculture
- c) Noise pollution
- d) Solid waste management

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**[B16 ENG 2201]**

**[B16 ME 3101]**  
 III/IV B.Tech. DEGREE EXAMINATION  
 First Semester  
**OPERATIONS RESEARCH**  
 MODEL QUESTION PAPER  
 DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**

**Answer any FOUR questions from the remaining.**

**All Questions Carry equal marks**

**All parts of a question must be answered at one place only**

1. Write short notes on the following. 14M
- (a) What are different phases of OR?
  - (b) What is meant by duality in LPP?
  - (c) What is no passing rule in Job Sequencing problems?
  - (d) What is meant by (M/M/1) : ( $\infty$ /FCFS) Queuing model ?
  - (e) Define Two-Person Zero-Sum game and Fair game.
  - (f) Define lead time and ROL with respect to inventory models.
  - (g) Define the three time estimates of PERT.

2. Solve the following LPP for optimal solution: 14M

$$\begin{aligned}
 \text{Maximize : } & Z = 5x_1 + 6x_2 \\
 \text{Subject to: } & x_1 + 2x_2 = 5 \\
 & x_1 - 5x_2 \leq -3 \\
 \text{and} & x_1 \text{ is unrestricted, } x_2 \geq 0
 \end{aligned}$$

3. VRR Limited produces three kinds of milk products A, B, and C. The monthly production is 1000; 2000; and 3000 units respectively. These products are sold through three departmental stores X, Y, and Z. Each store is to be supplied with 1500 units of products/month. However, store-Z does not want any product of type – A. The profit per unit of products sold to each store is given below. Suggest optimum policy schedule and the profit relevant. 14M

		STORES		
		X	Y	Z
MILK PRODUCTS	A	5	10	---
	B	16	8	9
	C	12	9	11

4. Solve the following TSP. There is no route between cities i and j if the value for  $C_{ij}$  is not shown. 14M

$$C_{12} = 4, C_{13} = 7, C_{14} = 3, C_{23} = 6, C_{24} = 3, C_{34} = 7, \text{ where } C_{ij} = C_{ji}$$

5. Find the sequence that minimizes the total elapsed time (T) required for completing the following tasks. Each job is processed in the order ACB. Find 'T' also. 14M

JOB	1	2	3	4	5	6	7
M /c -A	12	6	5	11	5	7	6
M /c -B	7	8	9	4	7	8	3
M /c -C	3	4	1	5	2	3	4

6. (a) Solve the following game by graphical method. 7M

	B1	B2	B3	B4
A1	4	-2	3	-1
A2	-1	2	0	1
A3	-2	1	-2	0

- (b) Vehicles arrive at a filling station with one pump in a Poisson fashion with an average of 15 vehicles /hour. The time taken for filling the tank is distributed exponentially with an average of 2.4 minutes. Determine: 7M
- The average number of units in the system.
  - Probability that a vehicle arriving has to wait for servicing.
  - Probability that the number of units in the system is 2.
  - Average time spent by a vehicle in the system.

7. A manufacturing company is required to purchase 4,800 castings per year. The requirement is assumed to be known and fixed. The castings are subject to quantity discounts. The price schedule is as follows: 14M

<u>Quantity</u>	<u>Unit cost (Rs.)</u>
$0 \leq q_1 < 500$	150.00
$500 \leq q_2 < 750$	138.75
$q_3 \geq 750$	131.25

The ordering cost is Rs.750 per order and  $I = 20$  percent per year. Find the optimum purchase quantity per order.

8. Consider a PERT project for which the following activities and the time estimates have been obtained. Draw the network and determine the: 14M
- Expected project duration, its variance and standard deviation.
  - Probability that the project is completed (a) as per schedule (b) 2 days earlier than expected.

Activity	(a, b, m)
1,2	5,8,6
1,4	1,4,3
1,5	2,5,4
2,3	4,6,5
2,5	7,10,8
2,6	8,13,9
3,4	5,10,9
3,6	3,5,4
4,6	4,10,8
4,7	5,8,6
5,6	9,15,10
5,7	4,8,6
6,7	3,5,8

**[B16 ME 3101]**

**[B16 ME 3102]**  
III/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**FLUID MECHANICS**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**

**Answer any FOUR questions from the remaining.**

**All Questions Carry equal marks**

**All parts of a question must be answered at one place only**

1. Write short notes on the following. 7x2=14M
  - (a) Define Newton's law of viscosity.
  - (b) What is meant by Total Pressure and Center of Pressure?
  - (c) Distinguish between laminar and turbulent flow.
  - (d) Differentiate between velocity Potential and Stream Function.
  - (e) Define Reynold's number.
  - (f) What is momentum thickness?
  - (g) What do you mean by Sub-sonic, sonic and supersonic flow?
2. (a) Derive an expression for Total pressure and Position of centre of pressure for inclined Plane surface. 7M  
(b) A 'U' tube manometer is used to measure the pressure of oil specific gravity 0.85 flowing in pipe line. Its left end is connected to the pipe and right end is opened to atmosphere. The centre of pipe is 100mm below the level of mercury in right limb. If the difference of mercury in two limbs is 160mm. Determine pressure of oil in pipe. 7M
3. (a) Derive Bernoulli's equation for incompressible fluid. State the assumptions made. 7M  
(b) Water flows through an orifice meter at the rate  $0.015\text{m}^3/\text{s}$  through a 100mm diameter orifice use in a 200mm Pipe. What is the difference of pressure head between upstream and vena contracta Section. Take  $C_c=0.6$  and  $C_v=1$ . 7M
4. (a) Derive an equation for flow rate through Venturimeter. 7M  
(b) In a 2D incompressible flow, the fluid velocity components are given by  $u = x - 4y$ ,  $v = -y - 4x$ . Show that velocity potential exist and determine its form and also find the stream function. 7M
5. (a) Derive an expression for Darcy Weis-bach equation for head Loss due to friction. 7M  
(b) An oil of viscosity 9 poise of and specify gravity 0.9 is flowing through a horizontal Pipe 60mm diameter. If the pressure drops in 100m length of the pipe is  $1800\text{KN/m}^2$ . Determine 7M
  - (i) Rate of flow oil
  - (ii) Maximum velocity

- (iii) Total frictional drag force over 100m length
- (iv) Power Required to maintain the flow
6. (a) Explain about Buckingham's  $\pi$ -theorem. 7M
- (b) The discharge 'Q' depends on the mass density of fluid  $\rho$ , speed of pump N, diameter of impeller D, the manometric head H, viscosity of fluid  $\mu$ , acceleration due to gravity g. Show that  $Q = ND^3 \phi \left[ \frac{gH}{N^2 D^2}, \frac{\mu}{\rho N D^2} \right]$  7M
7. (a) Derive an Equation for drag force over a flat plate due to boundary layer. 7M
- (b) Determine displacement thickness, momentum thickness and energy thickness for the velocity distribution  $\frac{u}{U} = 2 \left( \frac{y}{\delta} \right) - \left( \frac{y}{\delta} \right)^2$  7M
8. (a) Determine the equation for velocity of sound wave in compressible flow. 7M
- (b) Derive an equation for stagnation pressure and stagnation temperature in compressible flow. 7M

[B16 ME 3102]

**[B16 ME 3103]**  
III/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**IC ENGINES & GAS TURBINES**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**

**Answer any FOUR questions from the remaining.**

**All Questions Carry equal marks**

**All parts of a question must be answered at one place only**

1. Write a short notes on the following. 14M
  - (a) Explain the difference between four stroke and two stroke.
  - (b) Define Volumetric efficiency and Indicated thermal efficiency.
  - (c) What is the effect of Compression ratio and turbulence on knock in a diesel engine.
  - (d) What are anti-knock additives.
  - (e) State how the air compressors classified.
  - (f) State the fundamental difference between Jet and rocket propulsion.
  - (g) What is the necessity of inter cooling in gas turbines.
  
2. (a) Explain why any four stroke cycle engine is more efficient than a two stroke cycle engine, when a two stroke cycle engine has one power stroke in each revolution and a 4-S cycle engine has one power stroke for every two revolution. 7M  
(b) Show that for maximum work to be done per kg of air in a Otto cycle between upper and lower limits of absolute temperature  $T_1$  and  $T_3$ , the temperatures at the end of compression  $T_2$  and at the end of expansion  $T_4$  are equal and are given by  $T_2=T_4=\sqrt{(T_1T_3)}$ . 7M
  
3. (a) Describe the different phases of combustion phenomenon in SI engines with suitable sketches 7M  
(b) Discuss the requirement of a good combustion for SI engine. 7M
  
4. (a) What are open and dividend combustion chambers? Explain about the nozzles used in C.I. Engines. 7M  
(b) What are different stages of combustion in CI Engine? And explain with p- $\theta$  diagram. 7M
  
5. (a) Derive the work done for single stage reciprocating compressor. 6M  
(b) A single stage double acting air compressor is required to deliver  $14 \text{ m}^3$  of air per minute at 1.103bar and  $15^\circ\text{C}$ . The delivery pressure is 7bar and the speed is 300 rpm. Take the clearance volume as 5% of the swept volume with the compression and expansion index of  $n=1.3$ . Calculate Swept volume of cylinder and indicated power. 8M

6. (a) Describe briefly an axial flow compressor. 7M  
(b) A centrifugal compressor used as a supercharging for aero- engines handles 150Kg/min of air. The suction pressure and temperature are 1bar and 290K. The suction velocity is 80m/s. After compression in the impeller the conditions are 1.5 bar 345 K and 220 m/s. Calculate: (i) Isentropic efficiency (ii) Power required to drive the compressor (iii) The overall efficiency of the unit. It may be assumed that that K.E of air gained in the impeller is entirely converted into pressure in the diffuser. 7M
7. (a) Discuss briefly the methods employed for improvement of thermal efficiency of open cycle gas turbine plant. 7M  
(b) A gas turbine plant, that makes use of Brayton cycle in an application, takes in air at 1.2 bar (abs) and 200°C temperature and compresses it through a pressure ratio of 8. It is then heated to 8500°C in a combustion chamber and is expanded back to a pressure of 1.2 bar (abs). Calculate (i) the work done, (ii) the cycle efficiency and (iii) the work ratio. It is given that the “isentropic efficiencies” of the “turbine” and the “compressor” are, respectively, 80% and 70%. 7M
8. (a) Describe the working principle of the turbo jet engine. 7M  
(b) What are anti-knocking additives? Write about those additives briefly. 7M

**[B16 ME 3103]**

**[B16 ME 3104]**  
III/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**INDUSTRIAL MEASUREMENTS & METROLOGY**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**

**Answer any FOUR questions from the remaining.**

**All Questions Carry equal marks**

**All parts of a question must be answered at one place only**

- |    |   |     |
|----|---|-----|
| 1. | Write short notes on the following.                                       | 14M |
|    | (a) Backlash  |     |
|    | (b) Applications of electric comparator                                   |     |
|    | (c) Properties of optical fibers  |     |
|    | (d) Force measurement   |     |
|    | (e) Taylor's principle of gauge design                                    |     |
|    | (f) Advantages of radial drilling machine                                 |     |
|    | (g) Principle of autocollimator   |     |
| 2. | (a) Describe about measurement of screw threads?                          | 6M  |
|    | (b) Explain about measurement of spur gears?                              | 8M  |
| 3. | (a) Explain about stylus instruments for surface roughness measurement?   | 9M  |
|    | (b) Write about flatness measurement?                                     | 5M  |
| 4. | Explain the torque and pressure measurements in detail?                   | 14M |
| 5. | (a) Describe about fiber optic sensor configuration?                      | 7M  |
|    | (b) Explain about temperature sensors?                                    | 7M  |
| 6. | (a) Explain the working principle of slip gauges?                         | 7M  |
|    | (b) Write about optical dividing heads and rotary tables?                 | 7M  |
| 7. | Explain the various acceptance tests used for testing lathe?              | 14M |
| 8. | What are the static and dynamic characteristics of measuring instruments? | 14M |

**[B16 ME 3104]**

**[B16 ME 3105]**  
III/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**KINEMATICS OF MACHINES**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**

**Answer any FOUR questions from the remaining.**

**All Questions Carry equal marks**

**All parts of a question must be answered at one place only**

1. Write a short note on the following. 14M
  - (a) Difference between Mechanism and Structure.
  - (b) Write a short note on Correct Steering Gear Mechanism
  - (c) Write a short note on Anti-Friction bearings
  - (d) State Kennedy's Theorem.
  - (e) Write a short note on types of friction
  - (f) What is the function of Governor? How does it differ from flywheel?
  - (g) Define sensitiveness and Isochronism of a governor.
  
2.
  - (a) What are degrees of freedom of a mechanism? 4M
  - (b) Define an Inversion. Sketch and describe all the inversions of a single slider crank chain. 10M
  
3.
  - (a) Write a short note on angular velocity ratio theorem. 4M
  - (b) In a slider crank mechanism, the crank is 480 mm long and rotates at 20rad/s in counter-clockwise direction. The length of the connecting rod is 1.6 m. when the crank turns  $60^\circ$  from the inner dead centre, determine the 10M
    - i) Velocity of slider
    - ii) velocity of a point E located at a distance 450 mm on the connecting rod extended
    - iii) angular velocity of connecting rod
  
4.
  - (a) Write a short note on Klein's construction 6M
  - (b) Derive an expression for Coriolis acceleration component. 8M
  
5.
  - (a) Write a short note on Pantograph 4M
  - (b) The angle between the axes of two shafts joined by Hooke's joint is  $25^\circ$ . The driving shaft rotates at a uniform speed of 180 rpm. The driven shaft carries a steady load of 7.5 kw. Calculate the mass of the flywheel of the driven shaft if its radius of gyration is 150mm and the output torque of the driven shaft does not vary by more than 15% of the input shaft. 10M

6. (a) Write a short note on Anti-Friction bearings 4M  
(b) A cone clutch with a semi cone angle of  $15^\circ$  transmit 10KW at 600 rpm. The normal pressure intensity between the surfaces in contact is not to exceed  $100\text{kN/m}^2$ . The width of the friction surfaces is half of the mean diameter. Assume  $\mu=0.25$ . Determine i) the outer and inner diameters of the plate 10M  
ii) the width of the cone surface
7. The turning moment diagram of a petrol engine is drawn to a vertical scale of  $1\text{mm}=500\text{N}\cdot\text{m}$  on a horizontal scale of  $1\text{mm}=8^\circ$  the turning moment diagram will be for every half revolution the area above and below the mean torque lines are 260, 580, 80,380,870 and  $250\text{mm}^2$  respectively. Mass of the flywheel is 55kg and radius of gyration 2.1m engine rotates at a mean speed of 1600rpm. Determine the coefficient of speed. 14M
8. In spring controlled governor the controlling force curve is a straight line. The balls are 400mm apart when the controlling force is 1500N and 240mm when it is 800N. The mass of each ball is 10kg. Determine the speed at which the governor runs when the balls are 300mm apart. By how much should the initial tension be increased to make the governor Isochronous? Also find the Isochronous speed. 14M

[B16 ME 3105]

**[B16 ME 3106]**  
III/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**FINITE ELEMENT ANALYSIS**  
**(Elective-I)**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write a short notes on the following 6 M
  - (a) Write the characteristics of stiffness matrix.
  - (b) What is Isoparametric formulation?
  - (c) Define Plane stress condition.
  - (d) Write the stiffness matrix for a 3 noded triangular element.
  - (e) Define hermite shape functions.
  - (f) Write the properties of Shape functions.
  - (g) Write the applications of Finite Element Analysis.
2. (a) Derive the stress and strain relations for a 3D system. 7 M  
(b) Discuss in detail about the general procedure of FEM formulation with an example. 7 M
3. (a) Derive the elemental stiffness matrix for one dimensional quadratic element. 9 M  
(b) Differentiate between Bar and Truss elements in FEM formulation. 5 M
4. For the two-bar truss shown in Fig. 1, determine the displacements of node 1 and the stress in element 1-3. 14 M

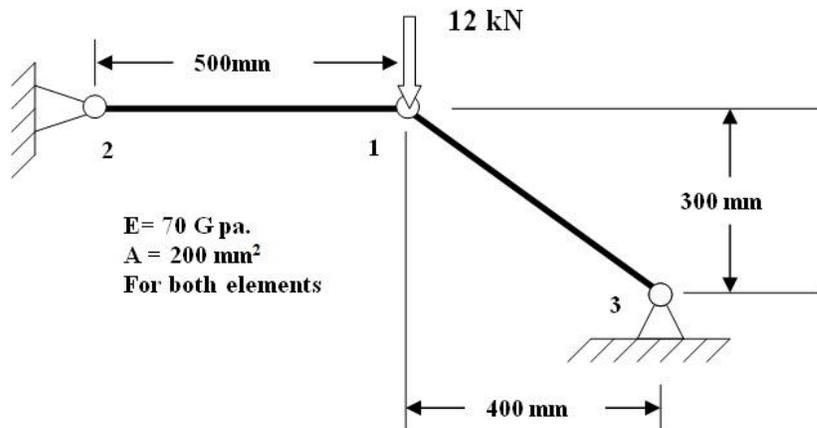


Fig. 1

4. A beam of 10 m length is fixed at one end and supported by a roller at the other end has a 20 kN concentrated load applied at the centre of the span. Calculate the deflection under the load. Assume  $E = 20 \times 10^5 \text{ N/mm}^2$  and  $I = 2500 \text{ cm}^4$ . 14 M
5. Derive the shape functions for the following higher order elements (i) Nine Nodded Quadrilateral Element (ii) Eight Nodded Quadrilateral Element (iii) Six Nodded Triangular Element 14 M
6. For the triangular plate shown in Fig. 2, determine the deflection at the point of load application and also stress induced in the plate using a one element model by considering it as plane stress problem. 14 M

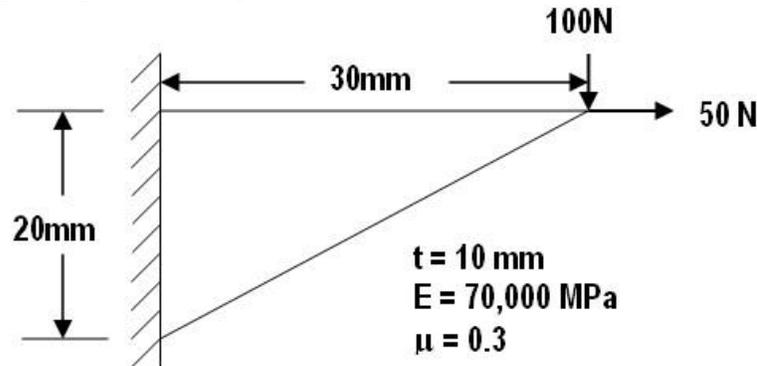


Fig. 2

7. Consider the bar as shown in Fig. 3 is subjected to a temperature difference of  $60^\circ\text{C}$ . Determine the nodal displacements and stresses induced in the elements. Take the coefficient of thermal expansions as  $18.9 \times 10^{-6}/^\circ\text{C}$  (for  $E=83\text{GPa}$  element),  $18.9 \times 10^{-6}/^\circ\text{C}$  (for  $E=70\text{GPa}$  element) and  $11.7 \times 10^{-6}/^\circ\text{C}$  (for  $E=200\text{GPa}$  element) respectively. 14 M

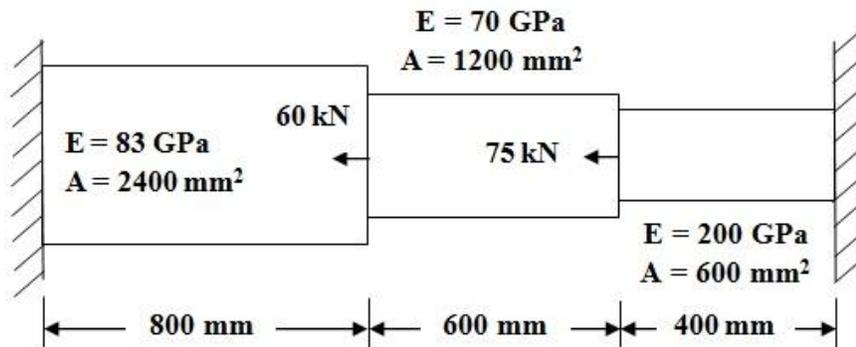


Fig. 3

8. (a) Evaluate  $\int_{-1}^1 [3e^x + x^2 + \frac{1}{(x+2)}] dx$  integral using one point and two point Gauss quadrature formulae and compare the results with exact solution. 7 M
- (b) An axi-symmetric body with a linearly distributed load on the conical surface is shown in Fig. 4. Determine the equivalent point loads at node 2 (60, 7 M

40), 4 (40, 55) and 6 (20, 70).

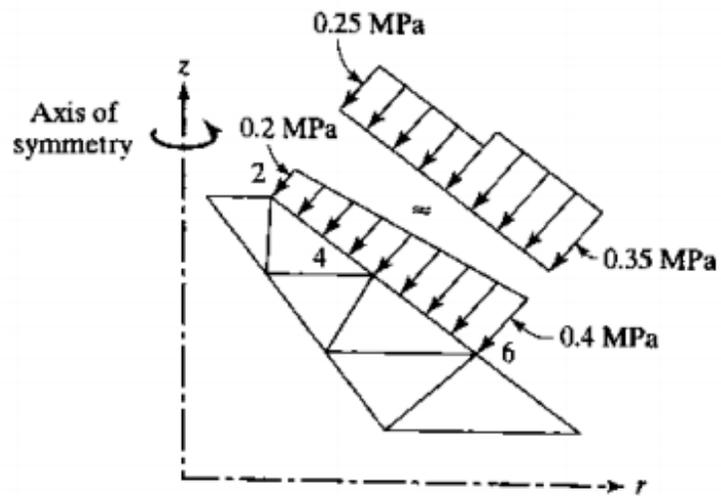


Fig. 4

[B16 ME 3106]

**[B16 ME 3107]**  
III/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**AUTOMATION IN MANUFACTURING**  
**(Elective-I)**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsory.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

- |    |  |     |
|----|--|-----|
| 1. | Write a short notes on the following.                                      | 14M |
|    | (a) Write a short notes on RFID  |     |
|    | (b) Write a short notes on single station manufacturing cell               |     |
|    | (c) Write a short notes on manual assembly lines                           |     |
|    | (d) Write a short notes on storage systems                                 |     |
|    | (e) Write a short notes on group technology                                |     |
|    | (f) Write a short notes on JIT   |     |
|    | (g) Write a short notes on CAPP  |     |
| 2. | (a) Explain levels of an automation  | 7M  |
|    | (b) Explain automation in production systems                               | 7M  |
| 3. | (a) Explain automated storage/retrieval systems                            | 7M  |
|    | (b) Explain about bar code technology                                      | 7M  |
| 4. | (a) Explain line balancing problem with an example                         | 7M  |
|    | (b) What are automation production lines                                   | 7M  |
| 5. | (a) Explain about production flow analysis                                 | 7M  |
|    | (b) Explain about group technology   | 7M  |
| 6. | (a) Explain about CMM  | 7M  |
|    | (b) Explain about inspection principles and its strategies                 | 7M  |
| 7. | (a) Explain about quantitative analysis                                    | 7M  |
|    | (b) Explain about non contact inspection methods                           | 7M  |
| 8. | (a) What are the hardware components for automation and production control | 7M  |
|    | (b) What are the automatic identification methods in material handling     | 7M  |

**[B16 ME 3107]**

**[B16 ME 3108]**  
III/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**TOOL DESIGN**  
(Elective-I)  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

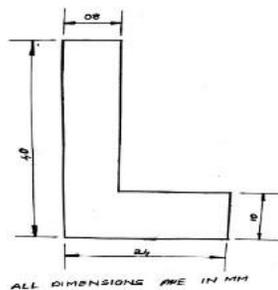
**Question No. 1 compulsory.**

Answer any **FOUR** questions from the remaining.

All Questions Carry equal marks

**All parts of a question must be answered at one place only**

1. Answer the following questions 14 M
  - a. Discuss the Principles of clamping.
  - b. What are the different types of Jigs.
  - c. Differentiate blank and punch
  - d. What are the applications of limit gauges
  - e. Explain briefly the difference between jigs and fixtures.
  - f. Discuss about mismatch with diagram.
  - g. Define injection moulding.
  
2.
  - a. Describe with a neat sketch 3-2-1 principle of locating a rectangular work piece. 7 M
  - b. With a neat sketch explain about mechanical actuation clamping devices. 7 M
  
3.
  - a. Draw a neat sketch of a milling fixture and explain by indicating its parts. 7 M
  - b. Explain the principles of lathe and milling fixtures. 7 M
  
4.
  - a. Write short notes on strippers, pressure plates and pilots. 7 M
  - b. Determine centre of pressure of the following banked shape. 7 M



5.
  - a. What are the advantages, disadvantages and application of die casting process 7 M
  - b. List the ejection methods and explain anyone with a neat sketch. 7 M

6. a. Determine the sizes of GO and NOGO gauges for checking the components with  $50H_7/f_8$  i.e.,  $50_{-0.00}^{+0.025}/50_{-0.119}^{+0.08}$  7 M  
b. Explain different tooling materials used and their composition. 7 M
7. a. Explain briefly about tool presetting. 7 M  
b. Explain with a neat sketch extrusion moulding process. 7 M
8. Write short notes on any three of the following. 14 M  
a. Different types of gauges.  
b. Spring back effect in bending.  
c. Broaching fixtures.  
d. Different types of dies.

**[B16 ME 3108]**

**[B16 ME 3109]**  
III/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**NON CONVENTIONAL ENERGY RESOURCES**  
**(Elective-I)**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsory.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

- |    |   |     |
|----|---|-----|
| 1. | Write Short Notes on  | 14M |
|    | (a) MHD Generator   |     |
|    | (b) Solar Energy Geometry   |     |
|    | (c) Lift and Drag   |     |
|    | (d) Advantages of Geothermal Energy   |     |
|    | (e) Site Selection of OTEC  |     |
|    | (f) Requirements for Nuclear Fusion   |     |
|    | (g) Principle of Energy Conservation  |     |
| 2. | What is the need for Renewable Energy Sources emphasizing the advantages and limitations of each System | 14M |
| 3. | (a) Explain Orientation.  | 4 M |
|    | (b) With neat sketch explain about different types solar collectors.                                    | 10M |
| 4. | (a) What are the different components in wind energy conversion, explain.                               | 7M  |
|    | (b) Explain about Photosynthesis.   | 7M  |
| 5. | (a) Explain the methods of ocean Thermal Electric Power Generation.                                     | 7M  |
|    | (b) Derive Energy and power from the waves  | 7M  |
| 6. | (a) Write the classification of small Hydro power Stations  | 5M  |
|    | (b) Explain Components of Hydro Electric Scheme.  | 9M  |
| 7. | (a) Write the requirements of nuclear fusion.   | 7M  |
|    | (b) List the advantages of nuclear fusion.  | 7M  |
| 8. | (a) Explain Co-generation.  | 7M  |
|    | (b) Write the applications of heat pumps  | 7M  |

**[B16 ME 3109]**

**[B16 ME 3110]**  
 III/IV B.Tech. DEGREE EXAMINATION  
 First Semester  
**PRODUCTION PLANNING AND CONTROL**  
**(Elective-I)**  
 MODEL QUESTION PAPER  
 DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**

**Answer any FOUR questions from the remaining.**

**All Questions Carry equal marks**

**All parts of a question must be answered at one place only**

1. Write short notes on the following. 7x2=14M
  - (a) What are the objectives of PPC?
  - (b) What is meant by forecasting?
  - (c) Differentiate EOQ and EPQ.
  - (d) What is chase planning?
  - (e) Define routing and loading.
  - (f) Differentiate forward and backward scheduling.
  - (g) Define the functions follow up and dispatching.
  
2.
  - (a) What are the functions of PPC? Explain 7M
  - (b) What are different types of production? Give examples. 7M
  
3.
  - (a) What are the types of forecasting ? Explain exponential smoothing method. 7M
  - (b) Use exponential smoothing and the data in the table to determine the un computed 7M  
 monthly forecasts (The slots marked by  $x$ 's) of 2017.

Month	Actual monthly demand	Monthly demand forecast using a smoothing factor of		
		0.2	0.5	0.8
April	120	120	120	120
May	140	X	x	X
June	160	X	x	X
July	110	X	x	X
August	120	X	x	X
September	110	X	x	X
October		X	x	X

4.
  - (a) Explain the fixed order quantity system and periodic review system. 7M
  - (b) A manufacturing company purchase 9000 parts of a machine for its annual 7M  
 requirements, ordering one month's usage at a time. Each part costs Rs. 20. The ordering cost per order is Rs.15 and the carrying charges are 15% of the average inventory per year. You have been assigned to suggest a more economical

purchasing policy for the company. What advice would you offer and how much would it save the company per year?

5. (a) Explain in detail about MRP and MRP-II. 7M  
 (b) Ten items kept in inventory by the school of management studies at central university are listed below. Perform ABC analysis on the items. 7M

Item	Annual usage (units)	Value per unit (Rs.)
1	200	40.00
2	100	360.00
3	2,000	0.20
4	400	20.00
5	6,000	0.04
6	1,200	0.80
7	120	100.00
8	2,000	0.70
9	1,000	1.00
10	80	400.00

6. (a) What is routing ? What are the factors affecting routing ? 7M  
 (b) What are Gantt charts? Explain with an example. 7M
7. (a) Explain in detail about line of balance technique of scheduling 7M  
 (b) A machine shop has 5 machines – A, B, C, D and E. Two jobs must be processed through each of these machines. The time (in hours) taken on each of the machines and the necessary sequence of jobs through the shop are given below. Use graphic method to obtain minimum elapsed time and the idle times on machines. 7M

Job-1	Sequence	A	B	C	D	E
	Time	2	3	4	6	2
Job-2	Sequence	B	C	A	D	E
	Time	4	5	3	2	6

8. (a) Explain the dispatching procedure. 7M  
 (b) What are the applications of computer in production planning and control ? 7M

[B16 ME 3110]

**[B16 ME 3111]**  
III/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**RAPID PROTOTYPING**  
**(Elective-I)**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsory.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write short notes on the following. 14M
  - (a) What are the advantages of RP?
  - (b) Brief the material system of 3D Printing.
  - (c) What is geometric modeling
  - (d) Why surface deviation occurs in SLS?
  - (e) What is LOM?
  - (f) Write the applications of LENS.
  - (g) What is Rapid Tooling?
  
2.
  - (a) List the classification of rapid prototyping systems and 7M
  - (b) Write the difference between digital prototyping and virtual prototyping. 7M
  
3.
  - (a) Explain the principle and process parameters of 3D Printing. 7M
  - (b) Write the applications of FDM. 7M
  
4.
  - (a) Briefly explain the principle and process details in Selective Laser Sintering with a neat sketch 7M
  - (b) Write the applications of 3D printing. 7M
  
5.
  - (a) Describe Fused Deposition Modeling process with a neat diagram. 7M
  - (b) List the materials available for powder based rapid prototyping system and write their respective applications. 7M
  
6. (a) Write the comparison between wireframe, surface and solid modeling techniques used in CAD modelling. 14M
  
7. (a) Write short note on (i) model reconstruction (ii) model slicing (iii) tool path generation. 14M

8. (a) What is meant by direct and indirect tooling 7M  
(b) Explain the importance of rapid tooling in computer integrated manufacturing. 7M

**[B16 ME 3111]**

**[B16 ME 3201]**  
III/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**INDUSTRIAL ENGINEERING & MANAGEMENT**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**

**Answer any FOUR questions from the remaining.**

**All Questions Carry equal marks**

**All parts of a question must be answered at one place only**

1. Write short notes on the following. 14M
- (a) Organization & management
  - (b) Labour Turnover & lay-off
  - (c) Picketing & Gherao
  - (d) Loading & Scheduling
  - (e) Travel chart
  - (f) Variables and attributes
  - (g) Therbligs

2. State and briefly explain the principles and functions of management. 14M
3. Discuss about the functions of personal management and theories of motivation. 14M
4. Briefly explain about the factors affecting the plant location with suitable examples. 14M
5. Explain Johnson's algorithm of job sequencing. 14M

The following table gives the machine times in hours for six jobs and two machines. The order of machines is AB. Find the optimum job sequence and the total elapsed time

Job( I )	1	2	3	4	5	6
Machine-A	5	9	4	7	8	6
Machine-B	7	4	8	3	9	5

6. What is method study? Explain the basic steps of method study an example. 14M
7. What are the objectives of purchasing department? 14M
- The demand for a commodity is 100 units per day. Every time an order is placed, a fixed cost of Rs 400/- is incurred. Holding cost is Rs 0.08 per unit per day. If the lead time is 12 days, determine the economic lot size and reorder point.
8. Discuss about control charts for variables and attributes. 14M
- Draw P-chart for the following process and comment on the control of the process. Take sample size equal to 50.

Sample No.	1	2	3	4	5	6	7	8	9	10
No. of Defectives	10	12	8	9	11	8	10	11	6	12

**[B16 ME 3201]**

**[B16 ME 3202]**  
III/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**FLUID MACHINERY & SYSTEMS**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**

**Answer any FOUR questions from the remaining.**

**All Questions Carry equal marks**

**All parts of a question must be answered at one place only**

1. Write short notes on the following. 14M
  - (a) Write short notes on Jet Propulsion. 2M
  - (b) How will you classify the Turbines? 2M
  - (c) Define the terms: Flow ratio and jet ratio. 2M
  - (d) Differentiate between an inward and outward flow reaction turbine. 2M
  - (e) How will you prevent the cavitation in hydraulic machines? 2M
  - (f) How will you classify the reciprocating pumps? 2M
  - (g) Explain the term hydraulic devices. Name any four hydraulic devices. 2M
2. (a) Show that the efficiency of a free jet striking normally as series of flat plates mounted on the periphery of a wheel never exceeds 50%. 7M  
(b) A metal plate of 10 mm thickness and 200 mm square is hung so that it can swing freely about the upper horizontal edge. A horizontal jet of water 20 mm diameter impinges with its axis perpendicular and 50 mm below the edge of the hinge and keeps it steadily inclined at  $30^\circ$  to vertical. Find the velocity of the jet, if the specific weight of the metal is  $7.45 \text{ kN/m}^3$ . 7M
3. A jet of water having a velocity of 60 m/sec impinges without shock on a series of vanes moving at 30 m/sec. The direction of motion of vanes being inclined at  $20^\circ$  to that of the jet. The angle between the inlet and outlet relative velocity is  $120^\circ$  and the ratio between these velocities is 0.9. 14M  
Determine:
  - a) The angle ' $\theta$ ' at the entry edge of the vane.
  - b) The work done by the vanes.
  - c) Hydraulic efficiency.
4. (a) A Francis turbine runner having a diameter of 2.92 m operates at 163.5 r.p.m., under 54 m head and develops 19900 kw at an efficiency of 87%. Find the other characteristics if this turbine operated under 60 m head. 9M  
(b) An impulse turbine at best speed produces 92 kw. Under a head of 63 m. By what percent should be speed be increased for a head of 87 m? 5M
5. (a) Explain the working principles of reciprocating pump with sketches. 7M

- (b) Explain the functions of air vessels in a reciprocating pump. 7M
6. (a) Explain the neat sketches the working of a single stage centrifuge pump. 5M
- (b) A centrifugal pump of the radial type delivers 5000 litres per minute against a total head of 38 m, when running at a speed of 1450 r.p.m. If the outer diameter of the impeller is 300 mm and its width at the outer periphery is 13 mm. Find the vane angle at exit. Assume manometric efficiency as 80%. 9M
7. (a) A single acting reciprocating pump has a diameter 0.3 m and a stroke length of 0.4 m. If the speed of the pump is 60 r.p.m and co-efficient of discharge is 0.97. Determine the percentage slip and actual discharge of the pump. 7M
- (b) Find the power required to drive a double acting pump and the quantity of water delivered per hour under the following conditions: 7M
- |                                  |   |           |
|----------------------------------|---|-----------|
| Head of water excluding friction | = | 16 m,     |
| Diameter of main                 | = | 1 m,      |
| Length of main                   | = | 2000 m,   |
| Diameter of cylinder             | = | 0.75 m,   |
| Speed of pump                    | = | 24 r.p.m. |
| Length of stroke                 | = | 1.5 m,    |
| Positive slip                    | = | 4%        |
| Mechanical Efficiency            | = | 80%       |
| Assume $f$                       | = | 0.01      |
8. (a) Describe with the help of a neat sketch the working of a hydraulic accumulator. 7M
- (b) An accumulator has ram 0.3 m in diameter and a lift of 7.5 m. Water is supplied at a pressure of 5900 kN/m. Find the necessary load on the ram and the capacity of the accumulator in kilowatt hours. 7M

**[B16 ME 3202]**

**[B16 ME 3203]**  
III/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**DESIGN OF MACHINE ELEMENTS**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

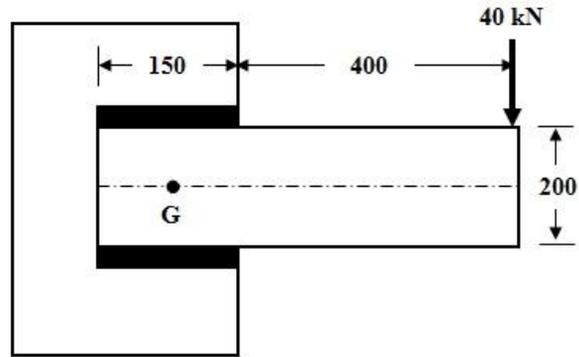
**Question No. 1 compulsory.**

**Answer any FOUR questions from the remaining.**

**All Questions Carry equal marks**

**All parts of a question must be answered at one place only**

1. Write short notes on the following. 14M
  - (a) Define factor of safety.
  - (b) What are surface and sizing factors?
  - (c) Define malleability and ductility.
  - (d) In what way splines are superior to keys?
  - (e) List the causes of stress concentration in a bolt.
  - (f) What is meant by nipping of leaf springs?
  - (g) Write the applications of knuckle joint.
2.
  - (a) Discuss in detail about design morphology. 7M
  - (b) Explain about any three static failure theories. 7M
3. A machine component is subjected to a flexural stress which fluctuates between + 300 MN/m<sup>2</sup> and – 150 MN/m<sup>2</sup>. Determine the value of minimum ultimate strength according to Gerber relation, Modified Goodman relation and Soderberg relation. 14M
4. A shaft made of mild steel is required to transmit 100 kW at 300 rpm. The supported length of the shaft is 3m. It carries two pulleys each weighing 1500 N supported at a distance of 1m from the ends respectively. Assuming the safe value of stress, determine the diameter of the shaft. 14M
5. Design a helical compression spring for a maximum load of 1000 N for a deflection of 25 mm using the value of spring index as 5. The maximum permissible shear stress for spring wire is 420 MPa and modulus of rigidity is 84 KN/mm<sup>2</sup>. 14M
6. Design and draw a cast iron flange coupling for a mild steel shaft transmitting 90 kW at 250 rpm. The allowable shear stress in the shaft is 40 MPa and the angle of twist is not to exceed 1° in a length of 20 diameters. The allowable shear stress in the coupling bolts is 30 MPa. 14M
7. A bracket carrying a load of 40 kN as shown in Figure. Calculate the size of the weld if the working shear stress is not to exceed 80 MPa. 14M



All dimensions are in mm

8. (a) Explain various methods of reducing stress concentrations. 7 M
- (b) Write the factors to be considered while designing machine parts to avoid fatigue failure? 7 M

[B16 ME 3203]

**[B16 ME 3204]**  
III/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**REFRIGERATION AND AIR CONDITIONING**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**

**Answer any FOUR questions from the remaining.**

**All Questions Carry equal marks**

**Allow Refrigeration Tables**

**All parts of a question must be answered at one place only**

1. Write short notes on the following. 14M
  - (a) Explain the term Tonne of refrigeration.
  - (b) Draw the P-V and T-S diagram for Carnot refrigeration cycle with vapour as refrigerant.
  - (c) Name principle components of a vapour compression refrigeration cycle.
  - (d) What are the desirable properties of Refrigeration?
  - (e) What are the advantages and limitations of steam jet refrigeration system?
  - (f) State the factors that determine Human comfort.
  - (g) What is dew point temperature? How it is related to dry bulb and wet bulb temperature at the saturation condition.
  
2.
  - (a) Derive an equation of COP for Bell-Coleman Air-refrigerator show different 6 processes on P-V and T-S Diagram
  - (b) An aircraft moving with speed of 1000 km/hr uses simple gas refrigeration cycle for 8 air conditioning. The ambient pressure and temperature are 0.35bar and  $-10^{\circ}\text{C}$  respectively. The pressure ratio of compressor is 4.5. The heat exchanger effectiveness is 0.95. The isentropic efficiencies of compressor and expander are 0.8 each. The cabin pressure and temperature are 1.06bar and  $25^{\circ}\text{C}$ . Determine temperature and pressures at all points of the cycle. Also find the volume flow rate through compressor inlet and expander outlet for 100 TR. Take  $C_p=1.005$  kJ/kg-K;  $R=0.287$  kJ/kg-K and  $C_p/C_v=1.4$  for air.
  
3.
  - (a) Explain the different method of improving the COP of simple compression 7 refrigeration cycle.
  - (b) A vapour compression refrigeration plant works between pressures limits of 5.3 bar 7 and 2.1 bar. The vapour is super heated at the end of compression, its temperature being  $37^{\circ}\text{C}$ . The vapour is super heated by  $5^{\circ}\text{C}$  before entering the compressor. If the specific heat of super heated vapour is 0.63KJ/Kg – K, find the COP of the plant.
  
4.
  - (a) How are refrigerants classified? Explain the properties of ammonia refrigerant. 7
  - (b) A single compressor using R-12 as refrigerant has three evaporators of capacity 7 30TR, 20TR and 10TR. The temperature in the three evaporators is to be maintained

at  $-10^{\circ}\text{C}$ ,  $5^{\circ}\text{C}$  and  $10^{\circ}\text{C}$  respectively. The condenser pressure is 9bar. The liquid refrigerant leaving the condenser is sub-cooled to  $30^{\circ}\text{C}$ . The vapour leaving the evaporators is dry and saturated. Assuming isentropic compression, calculate i) the mass of refrigerant flowing through each evaporator; ii) the power required to drive the compressor; and iii) C.O.P. of the system.

5. (a) Describe with a neat sketch about principles of operation of Electrolux refrigerator. 7  
(b) Derive the expression for COP of the Vapour absorption system. 7
6. (a) Explain the working of steam jet refrigeration system with a neat sketch. 7  
(b) Explain the working principle of vortex tube. Prove that the energy exchange phenomenon in vortex tube is not a violation of second law of thermodynamics. 7
7. (a) Explain about the cooling and dehumidification process with a neat sketch. 7  
(b) Explain about the factors influencing the effective temperature of human comfort. 7
8. (a) Explain about the summer and winter air conditioning with a neat sketch. 6  
(b) A circular duct of 40 cm is selected to carry air in an air conditioned space at a velocity of 440 m/min to keep the noise level at desired level. If this duct is replaced by a rectangular duct of aspect ratio of 1.5, find out the size of rectangular duct for equal friction method when i) the velocity of air in two ducts is same, ii) the discharge rate of air in two ducts is same. 8

**[B16 ME 3204]**

**[B16 ME 3205]**  
III/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**DYNAMICS OF MACHINES**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**

**Answer any FOUR questions from the remaining.**

**All Questions Carry equal marks**

**All parts of a question must be answered at one place only**

1. Write a short notes on the following. 14M
  - (a) Define forced vibrations and damped vibrations.
  - (b) Define simple gear train and compound gear train
  - (c) Explain free torsional vibration of a two rotor system
  - (d) State law of gearing
  - (e) Classify the cams
  - (f) What is meant by gyroscopic couple
  - (g) Explain primary and secondary balancing
  
2. (a) Define and derive the natural frequency of free longitudinal vibrations of single degree freedom system. Using Energy method and Rayleigh's method 7M
  
- (b) A Vibrating system consists of a mass of 50kg, a spring with a stiffness of 30kN/m and a damper. The damping provided is only 20% of the critical value. Determine the (i) Damping factor (ii)Critical damping coefficient (iii)Natural frequency of damped vibration (iv)logarithmic decrement. 7M
  
3. An epicyclic gear consist of a pinion, a wheel of 40 teeth and an annulus with 84 teeth concentric with the wheel. The pinion gears with the wheel and annulus. The arm that carries the axis of the pinion rotates at 100rpm.If the annulus is fixed, find the speed of the wheel. If the wheel is fixed, find the speed of the annulus 14M
  
4. (a) Derive an expression for the minimum number of teeth required on the pinion in order to avoid interference in involute gear teeth when it meshes with wheel 9M
  
- (b) A pair of involute spur gears with  $16^\circ$  pressure angles and pitch of module 6mm is in mesh. the no of teeth on pinion is 16 and its rotational speed is 240r.p.m. when the gear ratio is 1.75, find in order that the interference is just avoided; (i)the addendum on pinion and gear wheel(ii)the length of path of contact 5M

5. Draw the profile of a cam operating a knife edge follower when the axis of follower passes through the axis of cam shaft from the following data; (a) follower to move outwards through 40mm during  $60^\circ$  of cam rotation, (b) follower to dwell for the next  $45^\circ$ , (c) follower to return to its original position during next  $90^\circ$ , (d) follower to dwell for the rest of the cam rotation. The displacement of the follower is to take place with simple harmonic motion during both the outward and the return strokes. The least radius of the cam is 50mm. If the cam rotates at 300r.p.m., Determine the maximum velocity and acceleration of the follower during the outward stroke 14M
6. (a) Explain the effect of gyroscopic couple on an aeroplane. 7M  
 (b) The turbine rotor of a ship having a mass of 200kg rotates at 2000rpm and its radius of gyration is 0.3m if the rotation of the rotor is clock wise looking from the aft, determine the gyroscopic couple set by the rotor when (i) ship takes a left hand turn at a radius of 300m at a speed of 30 kmph (ii) ship pitches with the bow raising at an angular velocity of 1 rad/sec (iii) ship rolls at an angular velocity of 0.1 rad/sec 7M
7. (a) Explain primary direct and reverse cranks 4M  
 (b) The following data represents 4 cylinder vertical inline engine speed 310rpm length of crank 25cm, length of connecting rod 100cm intermediate cranks are at right angles to each other and reciprocating masses attached to these cranks are 5000n each distance between intermediate cranks are 50cm and are placed symmetrically between extreme cranks is 200cm. If the engine is balanced completely for primary forces and couples Determine orientation of outer cranks and reciprocating masses attached to it determine unbalanced secondary force or couple if any 10M
8. (a) Derive an equation for the natural frequency of transverse vibration of a simply supported beam subjected to an UDL 9M  
 (b) What do you mean by whirling of shaft? Derive the expression for amplitude of vibration of shaft supporting a disc at the mid span 5M

[B16 ME 3205]

**[B16 ME 3206]**  
III/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**CONTROL SYSTEMS**  
**(Elective-II)**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write short notes on the following. 14M
  - (a) What is Transfer function?
  - (b) What is closed loop control system?
  - (c) Explain signal flow diagram?
  - (d) Describe state transition matrix?
  - (e) Differentiate order and type number of system?
  - (f) What is Time response?
  - (g) What is Frequency response?
2. (a) Explain the modeling of mechanical system elements and derive the equation for mechanical systems. 14M
3. (a) Draw and explain feedback system and its effect. 7M  
(b) Explain the impulse response and transfer function of linear systems? 7M
4. (a) What are the typical test signals for the time response of control systems? 7M  
(b) Explain the Routh-Hurwitz criterion in detail. 7M
5. Find the inverse Laplace transforms of the following functions: 14M
  - (i)  $G(s) = \frac{1}{(s+2)(s+3)}$
  - (ii)  $G(s) = \frac{1}{s(s+4)(s+1)}$
6. (a) Explain the methods for determining stability of linear control systems? 7M  
(b) Define steady state error. Calculate the steady state error for various standard test signals. 7M
7. Sketch the Nyquist plot for a unity feedback control system with a forward transfer function and discuss the suitability of the system. 14M  
$$G(s) = \frac{15}{s(s+1)(s+2)(s+3)}$$
8. For the system with state model where 14M  
 $x = Ax + Bu; y = cx$

$$A = \begin{bmatrix} -1 & 0 & 1 \\ 1 & -2 & 0 \\ 0 & 0 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \quad C = [1 \ 1 \ 0]$$

Obtain the transfer function and obtain the solution of state equation in terms of initial conditions.

$$X_0 = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

**[B16 ME 3206]**

**[B16 ME 3207]**  
III/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**OPTIMIZATION TECHNIQUES**  
**(Elective-II)**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write short notes on the following. 14M
  - (a) Define local optimum and global minimum.
  - (b) Write demerits of classical optimization techniques.
  - (c) What is Hessian matrix?
  - (d) What is Unimodal function?
  - (e) What is gradient of a function?
  - (f) Explain two point crossover.
  - (g) Outline the global criterion method.
2. Minimize:  $3x_1^2 + 4x_2^2 + 5x_3^2$  such that  $x_1 + x_2 + x_3 = 10$  using Lagrange's multiplier method. 14M
3. Use Kuhn-Tucker conditions to maximize:  $f(x_1, x_2) = 2x_1^2 + 12x_1x_2 - 7x_2^2$  14M  
Subject to:  $2x_1 + 5x_2 \leq 98$
4. Find the value of  $x$  in the interval  $(1, 5)$  which minimizes the function  $f = x^2 + 54/x$  14M  
by (a) Dichotomous search method, and (b) Golden section method.
5. Minimize:  $f(x_1, x_2) = 2x_1^2 + x_2^2$  by using steepest descent method with the starting point  $(1, 2)$ . Use two iterations. 14M
6. Minimize:  $f = x_1 - x_2 + 2x_1x_2 + 2x_1^2 + x_2^2$  using Nelder-Mead's Simplex method. 14M  
Take the points defining the initial Simplex as:  
$$\mathbf{X}_1 = \begin{Bmatrix} 4.0 \\ 4.0 \end{Bmatrix}, \quad \mathbf{X}_2 = \begin{Bmatrix} 5.0 \\ 4.0 \end{Bmatrix}, \quad \mathbf{X}_3 = \begin{Bmatrix} 4.0 \\ 5.0 \end{Bmatrix}$$
  
and  $\alpha = 1.0, \quad \beta = 0.5, \quad \gamma = 2.0.$
7. (a) Explain the working principle of Genetic Algorithm. 7M  
(b) What are the drawbacks of GA? 7M

8. A company manufactures two products, radios and transistors, which must be processed through assembly and finishing departments. Assembly has 90 hours available and finishing can handle up to 72 hours of work. Manufacturing one radio requires 6 hours in assembly and 3 hours in finishing. While manufacturing one transistor requires 3 hours in assembly and 6 hours in finishing. If profit is Rs. 120 per radio and Rs. 90 per transistor, determine the best combination of radios and transistors to realize a maximum profit of Rs. 2100/-. Solve by goal programming method. 14M

**[B16 ME 3207]**

**[B16 ME 3208]**  
III/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**AUTOMOBILE ENGINEERING**  
**(Elective-II)**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsory.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write short notes on the following. 14M
  - (a) Name the major components of an automobile? 2M
  - (b) What are the functions of Piston rings? 2M
  - (c) What is the maximum torque for clutch is usually designed? 2M
  - (d) What are the approximate gear ratios provided in the three forward speed gear box? 2M
  - (e) How is the length of propeller shaft varied automatically? 2M
  - (f) If the spring leaves are not lubricated, what may be the result? 2M
  - (g) What do you understand by wheel alignment? 2M
  
2.
  - (a) Explain different types of combustion chambers employed in diesel engines? 7M
  - (b) By what method of heat transfer does heat travel from the cylinder walls to the water in the water jacket? Explain? 7M
  
3.
  - (a) Write a short note on Automotive emissions? 7M
  - (b) Explain the working and construction of Mufflers? 7M
  
4.
  - (a) Illustrate the construction and working of a Single plate, dry disc clutch? 7M
  - (b) Describe centrifugal clutch. How a fluid fly-wheel differs from it in working? 7M
  
5.
  - (a) What role lubricating oil plays working of an engine? What characteristics lubricating oil should possess? 7M
  - (b) What is an ignition system and discuss different types of ignition systems? 7M
  
6.
  - (a) What is the difference between constant mesh and synchromesh? Describe any one of them? 7M
  - (b) What is torque converter? How it differs from gear box? 7M
  
7.
  - (a) What are the different types of shock absorbers? Explain them ? 7M

- (b) What are the different types of Wheels? Explain any one? 7M
8. (a) Which factors influence steering? Explain? 7M
- (b) Construct a diagram of a simple mechanical brake system? 7M

**[B16 ME 3208]**

**[B16 ME 3209]**  
III/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**SUPPLY CHAIN MANAGEMENT**  
**(Elective-II)**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

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**Question No. 1 compulsory.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write a short notes on the following. 14M
  - (a) What are the drivers of supply chain performance?
  - (b) Explain make or buy decision.
  - (c) What is worldwide sourcing?
  - (d) What is supply chain network?
  - (e) Define supply chain integration.
  - (f) What is SC restructuring?
  - (g) What is an agile supply chain?
  
2. (a) Discuss the goal of supply chain and explain the impact of supply chain decision on success of the firm. 7M  
(b) Explain the decision phases in Supply Chain Management. 7M
  
3. (a) Explain how a global world class supplier base can be created. 7M  
(b) Discuss the role of each supply chain drivers in creating strategic fit between the supply chain strategy and competitive strategy. 7M
  
4. (a) Identify the major drivers of supply chain performance. 7M  
(b) Discuss the Distribution Network Design 7M
  
5. (a) Explain how to manage supply chain cycle inventory. 7M  
(b) Explain multiple location inventory management with an appropriate example. 7M
  
6. (a) Elaborate on the role of cycle inventory in a supply chain. Explain how uncertainty in the supplier chain managed. 7M  
(b) What are some ways that a firm such as Wal-Mart from out sourcing decisions? 7M
  
7. (a) Explain the purpose and benefits of Supply Chain Integration. 7M

- (b) Explain the need and process of Supply Chain Process restructuring 7M
8. (a) What type of distribution network is typically best suited for commodity items? 7M
- (b) Discuss the major challenges that must be overcome to manage supply chain Successfully. 7M

**[B16 ME 3209]**

**[B16 ME 3210]**  
III/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**NANO TECHNOLOGY**  
**(Elective-II)**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

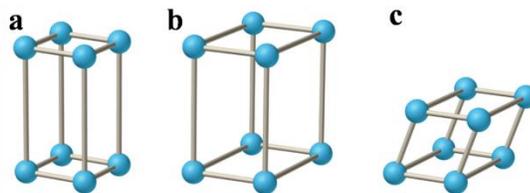
**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write short notes on the following. 14M
- (a) Define Nanotechnology?
  - (b) What will be the effect of size reduction on properties?
  - (c) Define top down and bottom up approach.
  - (d) Write about the principle of AFM
  - (e) What are the unique characteristics of carbon nanotubes?
  - (f) What are the applications of quantum dots?
  - (g) What are allotropes of carbon?

2. (a) How do you classify nanomaterials? Explain in brief 6M
- (b) Define the following terms? 2M
- 1. Unit Cell
  - 2. Lattice
- (c) Predict the lattice systems, lattice constants and lattice angles for the following crystals. 6M



3. (a) Write about the mechanical properties of nano materials. 7M
- (b) Discuss about magnetic properties like ferromagnetic, ferrimagnetics and antiferri magnetic with sketches. 7M
4. (a) Discuss the difference between CVD and PVD process. 7M
- (b) Write short notes on the following synthetic techniques for nanomaterials. 7M
- 1. Sol-gel method
  - 2. Lithography

5. (a) What is the purpose of TEM? Explain its principle. 7M  
(b) Describe in detail about the principle and process of X ray diffraction technique with neat sketch. 7M
6. (a) List out various applications of nano crystalline diamond films. 7M  
(b) Discuss the applications of graphene. 7M
7. (a) What are the various materials used in Diagnostics and Therapeutic applications. 7M  
(b) What are the potential effects of nanomaterials to environment? 7M
8. (a) Explain the working principle of X-ray photoelectron spectroscopy. 7M  
(b) With a neat sketch, explain mechanical milling process for synthesis of nano particles? List advantages and disadvantages 7M

**[B16 ME 3210]**

**[B16 ME 3211]**  
III/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**COMPUTATIONAL FLUID DYNAMICS**  
**(Elective-II)**  
MODEL QUESTION PAPER  
DEPARTMENT OF MECHANICAL ENGINEERING

**Time: 3 Hrs.**

**Max. Marks: 70**

**Question No. 1 compulsory.**  
**Answer any FOUR questions from the remaining.**  
**All Questions Carry equal marks**  
**All parts of a question must be answered at one place only**

1. Write a short notes on the following. 14M
  - (a) What are the types of partial differential equation used in CFD
  - (b) What is the role of CFD in engineering predictions
  - (c) What are the fundamental governing equation of fluid dynamics
  - (d) When do you use forward ,backward and central difference expressions
  - (e) Differences between finite volume and finite element method
  - (f) Write the advantages of structured grids and unstructured grids
  - (g) Distinguish between conservative and non conservative Forms of a fluid flow equations
  
2.
  - (a) Justify CFD is a research tool. Write and explain the steps involved in CFD process. 7 M
  - (b) What is the difference between the Euler's model and Navier stokes model of equations? Write the generic form of Navier Stokes model. 7 M
  
3.
  - (a) What is discretization? Explain the need for discretization. Explain FDM, FEM and FVM. 7 M
  - (b) Discuss Explicit and Implicit approach for discretization techniques 7 M
  
4.
  - (a) Derive governing flow equations for flow over a flat plate 7 M
  - (b) Why Pressure velocity coupling is required to solve incompressible fluid flow problems? 7 M
  
5.
  - (a) Using von Neumann stability analysis finds the criteria for the stability of the discretized equation  $\frac{\partial u}{\partial t} + a \frac{\partial u}{\partial x} = 0 ; a > 0$  7 M
  - (b) Discuss the relative merits and demerits of primitive variable formulation and vorticity stream function formulation for solving the incompressible fluid flow problems. 7 M
  
6.
  - (a) Explain the meaning of the term 'residual' in variational methods. 7 M
  - (b) Write suitable examples explain the physical significance of elliptic, parabolic and hyperbolic problems 7 M

7. Write the applications of Computational fluid dynamics in various engineering divisions 14M
8. (a) Explain the pressure correction method using an example for incompressible viscous flow 14M

**[B16 ME 3211]**

**[B16ME4101]**  
IV/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**COMPUTER AIDED DESIGN**  
**MECHANICAL ENGINEERING**  
MODEL QUESTION PAPER

**Time: 3 Hrs.**

**Max. Marks: 70**

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Question No. 1 compulsory.

Answer any FOUR questions from the remaining.

All Questions Carry equal marks

All parts of a question must be answered at one place only.

1. Write short notes on the following:
  - a. What are the benefits of the CAD? 2M
  - b. Explain the term geometric transformations 2M
  - c. Write short notes on result presentation. 2M
  - d. Write short notes on display files. 2M
  - e. Explain operating system and its applications. 2M
  - f. What are softwares available for FEM? Give their features. 2M
  - g. the application of AI in the design. 2M
  
2.
  - a. What are the basic techniques used in current computer graphics terminals for generating the image on the CRT screen. Explain briefly with illustrations. 7M
  - b. Discuss the working principles of following input devices. (i) cursor control devices 7M  
(ii) digitizers
  
3.
  - a. A rectangle is formed with vertices A (50, 50), B (100, 50), C (100, 80) & D (50, 80). (i) Calculate the new co-ordinates of the rectangle reduced to in size using a scaling factor of 0.5, 0.6. (ii) If the rectangle is reduced to square of side equal to smaller side of the rectangle. 7M
  - b. What are types of geometric modelling techniques? Explain in detail. 7M
  
4.
  - a. What do you understand by Finite Element Modeling? Give an example of modeling a mechanical component. 7M
  - b. Give details of various types of element shapes usually employed for modeling components. 7M
  
5.
  - a. Explain about the computer aided design of a coil spring in details. 7M
  - b. Discuss the kinematics of a four bar mechanism. 7M
  
6.
  - a. Discuss the structure of an expert system 7M
  - b. s AI useful in computer aided design? Explain in detail. 7M

7. a. What are graphic standards? What are the various graphic standards used in CAD software development? 7M
- b. Discuss the working principle of the DVST graphics terminal 7M
8. a. Write short notes on automatic mesh generation with an illustrative example. 7M
- b. Explain the salient features of ANSYS package in detail. 7M

**[B16ME4101]**

**[B16ME4102]**  
IV/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**MACHINE DESIGN**  
**MECHANICAL ENGINEERING**  
MODEL QUESTION PAPER

**Time: 3 Hrs.**

**Max. Marks: 70**

Question No. 1 compulsory.

Answer any FOUR questions from the remaining.

All Questions Carry equal marks

All parts of a question must be answered at one place only.

1. Write short notes on the following:
  - a. Write short notes on involute Gear tooth 2M
  - b. What are the different materials used for piston? 2M
  - c. What is meant by friction clutch? 2M
  - d. Explain self locking of brake. 2M
  - e. What is meant by hydrodynamic lubricated bearings? 2M
  - f. List the material used for wire ropes. 2M
  - g. List the classification of composites. 2M
  
2. A pair of  $20^\circ$  full depth spur gear transmits 30kw at speed of 250rpm of the pinion. 14M  
The velocity ratio is 1:4. The pinion is made of steel having allowable stress of 100Mpa, while the gear is made of C.I. having a static stress of 55Mpa. The pinion has 20 teeth and face width is 12.5 times the module. Find module, face width, pitch diameters, also check for wear load
  
3. A four stroke IC engine has the following specifications: 14M  
Brake power = 7.5 KW, Stroke= 125 mm, Max gas pressure= $3.5 \text{ N/mm}^2$   
IMEP =  $0.35 \text{ N/mm}^2$ , Mechanical efficiency=80% , Speed=1000rpm  
Determine the dimensions if the cylinder if the length of the stroke is 1.5 times the bore of the cylinder, wall thickness if hoops stress is 35Mpa, thickness of the cylinder head and size of the studs when the permissible stress for the cylinder head and stud materials are 45 & 65 Mpa respectively.
  
4. A cone clutch is to be designed to transmit 7.5 KW at 900 rpm. The cone has an face 14M  
angle of  $12^\circ$  The width of the face is half of the mean radius and normal pressure between the contact surfaces is not to exceed  $0.09 \text{ N/mm}^2$  Assuming uniform wear condition and coefficient of friction as 0.2. Find the dimensions of the clutch and axial force necessary to engage the clutch.
  
5. A block brake as shown in the Fig. 1 provide a braking torque of 360 N-m.the 14M

diameter of the brake drum is 300mm.the coefficient of friction is 0.3.find

- a) The force P to be applied for clockwise and anticlockwise rotation of the brake drum
- b) The location of pivot for fulcrum to make the brake self locking for clockwise rotation of the drum

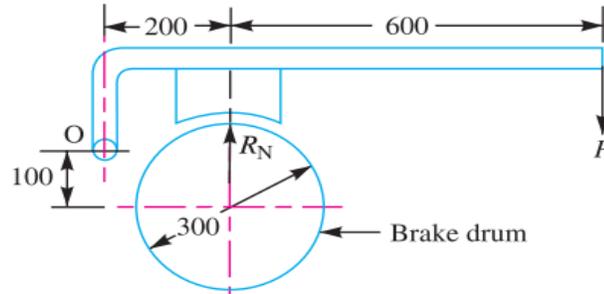


Fig. 1

6. Design a journal bearing to resist a load of 8KN. The oil used has a viscosity of 0.0087 kg/m-sec at operating temperature of 80<sup>0</sup> C, shaft speed is 720rpm. Bearing diametral clearance is 0.25mm and ambient temperature is 30<sup>0</sup>c. if the heat radiating capacity of the bearing is 150 w/m<sup>2</sup>/<sup>0</sup>C, determine whether artificial cooling is necessary. 14M
7. Design a chain drive to actuate a compressor from 15 KW electric motor running at 1000 r.p.m., the compressor speed being 350 r.p.m. The minimum centre distance is 500 mm. The compressor operates 16 hours per day. The chain tension may be adjusted by shifting the motor on slides. 14M
8. a What are the different stresses induced in the wire ropes? 8 M  
 b Write the application of composite materials 6 M

[B16ME4102]

**[B16ME4103]**  
IV/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**HEAT AND MASS TRANSFER**  
**MECHANICAL ENGINEERING**  
MODEL QUESTION PAPER

**Time: 3 Hrs.**

**Max. Marks: 70**

Question No. 1 compulsory.

Answer any FOUR questions from the remaining.

All Questions Carry equal marks

All parts of a question must be answered at one place only.

1. Write short notes on the following:
  - a. State Fourier's law of heat conduction? Why the negative sign is used 2M
  - b. What is Transient heat Conduction. 2M
  - c. Differentiate between laminar and turbulent flow. 2M
  - d. What do you mean by absorptivity? 2M
  - e. What is fouling factor. 2M
  - f. Discuss the advantage of NTU method over the LMTD method. 2M
  - g. State the Fick's law of diffusion. 2M
  
2.
  - a. Derive the General heat Conduction Equation in cylindrical Co-ordinates. 7M
  - b. Does any of the energy of the sun reach the earth by conduction or convection? Explain. 7M
  
3.
  - a. A wire of 6mm diameter with 2mm thick insulation ( $k=0.11 \text{ w/mk}$ ). If the convective heat transfer coefficient between the insulating surface and air is  $25 \text{ w/m}^2\text{k}$ . Find the critical thickness of insulation and also find the percentage of change in the heat transfer rate if the critical radius is used. 7M
  - b. A composite insulating wall has three layer of material held together by 4cm diameter aluminum ( $k=200 \text{ w/mk}$ ) rivet per  $0.1 \text{ m}^2$  of surface. the layer of materials consists of 12cm thick brick ( $k= 0.90 \text{ w/mk}$ ) with hot surface at  $220^\circ\text{C}$ , 22cm thick timber ( $k=0.110 \text{ w/mk}$ ) with cold surface at  $15^\circ\text{C}$ . These two layers are interposed by third layer of insulating material 1.5cm thick of conductivity  $0.170 \text{ w/mk}$ . Calculated the percentage of increase in heat transfer rate due to rivet. 7M
  
4.
  - a. What are the advantages and limitations of dimensional analysis. 7M
  - b. Air at  $20^\circ\text{C}$  and one atmosphere flows over a flat plate at  $35 \text{ m/s}$ . The plate is  $75 \text{ cm}$  long and is maintained at  $60^\circ\text{C}$ . Calculate the heat transfer per unit width of the plate. Also calculate the turbulent boundary layer thickness at the end of the plate assuming it to develop from the leading edge of the plate. 7M
  
5.
  - a. Explain what do you mean by absorptivity, reflectivity and transmissivity. 7M

- b. Two circular disc of diameter 20cm each are placed 2m apart. Calculate the radiant heat exchange for these plates if these are maintained at 800°C and 300°C respectively and their corresponding emissivities are 0.3 and 0.5. 7M
6. a. Derive the equation for parallel flow heat exchanger using NTU method. 7M  
 b. In a food processing plant, a brine solution is heated from 8°C to 14°C in a double pipe heat exchanger by water entering at 55°C and leaving at 40°C at the rate of 0.18kg/s. if the overall heat transfer coefficient is 800 W/m<sup>2</sup>K, determine the area of heat exchanger required. 7M  
 a) For a parallel flow arrangement,  
 b) For counter flow arrangement. Take  $c_p$  for water = 4.18kJ/kgK.
7. a. Distinguish between nucleate and film boiling. 7M  
 b. Water is to be boiled at atmospheric pressure in a polished copper pan by means of an electric heater. The diameter of the pan is 0.38m and is kept at 115°C. Calculate the following. 7M  
 1. Power required to boil the water.  
 2. Rate of evaporation.  
 3. Critical heat flux.
8. a. Discuss briefly the Analogue between heat and mass Transfer 7M  
 b. Explain Equimolar counter diffusion in gases. 7M

**[B16ME4103]**

**[B16ME4104]**  
 IV/IV B.Tech. DEGREE EXAMINATION  
 First Semester  
**MECHANICAL VIBRATIONS**  
**MECHANICAL ENGINEERING**  
 MODEL QUESTION PAPER

**Time: 3 Hrs.**

**Max. Marks: 70**

Question No. 1 compulsory.

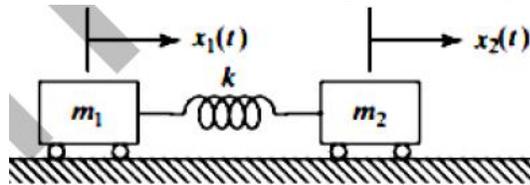
Answer any FOUR questions from the remaining.

All Questions Carry equal marks

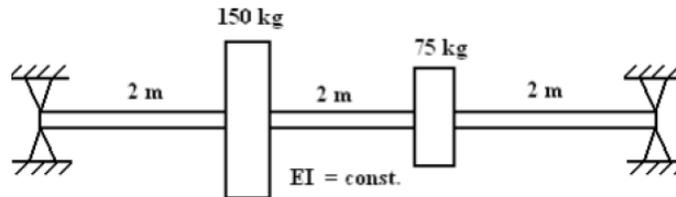
All parts of a question must be answered at one place only.

1. Write short notes on the following:
 

a. Differentiate between natural and forced vibrations.	2M
b. What is meant by damping ratio?	2M
c. Define damped and undamped system	2M
d. What is meant by logarithmic decrement?	2M
e. What do you know about the vibration isolation?	2M
f. Define transmissibility?	2M
g. What is secondary critical speed?	2M
  
2. a. Derive the natural frequency of free longitudinal vibrations of single degree freedom system using Energy method and Rayleigh's method. 7M  
 b. Explain with neat sketch about the working of vibrometer. 7M
  
3. Prove that the system shown below is a Semi-definite System? Determine the natural mode of vibrations of the system when  $m_1=15\text{Kg}$  ,  $m_2=20\text{ Kg}$  and  $k=480\text{N/m}$  14M



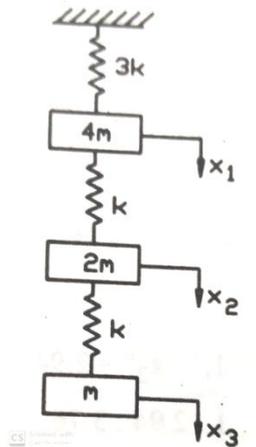
4. Find the lowest natural frequency of transverse vibrations for the system shown below by matrix iteration method,  $E = 1.84 \times 10^{11} \text{ N/m}^2$ ,  $I = 10^{-6} \text{ m}^4$ . 14M



5. Derive the equation of motion, the natural frequency and the mode shapes, for the 14M

transverse vibration of a beam simply supported at its ends?

6. A shaft 1.5cm diameter and 1m long is held in long bearings. The weight of the disc at the center of the shaft is 15 Kg. The eccentricity of the CG of the disc from center of rotor is 0.03 cm. E of the material of shaft is  $2 \times 10^6$  Kg/cm<sup>2</sup> . The permissible stress in the shaft material is 700 Kg/cm<sup>2</sup> . (Neglecting the weight of the shaft). Find i) The critical speed of the shaft. ii) The range of speed over which it is unsafe to run the shaft 14M
7. a. Explain the principles of orthogonality in the natural mode oscillation of a dynamic system? 7M  
b. A seismic instrument has natural frequency of 6 Hz. What is the lowest frequency beyond which the amplitude can be measured within 2% error? Neglect damping. 7M
8. For a three degree of freedom system shown in Figure below, find the lowest natural frequency using Stodola's method. 14M



[B16ME4104]

**[B16ME4105]**  
 IV/IV B.Tech. DEGREE EXAMINATION  
 First Semester  
**PROJECT MANAGEMENT**  
**MECHANICAL ENGINEERING**  
 MODEL QUESTION PAPER

**Time: 3 Hrs.**

**Max. Marks: 70**

Question No. 1 compulsory.

Answer any FOUR questions from the remaining.

All Questions Carry equal marks

All parts of a question must be answered at one place only.

1. Write short notes on the following:
  - a. Project life cycle 2M
  - b. Gantt chart 2M
  - c. Resource loading 2M
  - d. Project team 2M
  - e. Resource levelling 2M
  - f. Tools of project planning 2M
  - g. Risks in projects 2M
  
2.
  - a. State the characteristics of projects. 7M
  - b. Elucidate different stages in project management. 7M
  
3.
  - a. Define and state the objectives of project management. 7M
  - b. Describe the role of work break down structure in project planning and control. 7M
  
4.
  - a. Describe how GERT overcomes the limitations of PERT/CPM. 7M
  - b. 7M

S. No	ACT	DUR	PREDECESSORS
5	B	5	
10	M	4	B
15	N	9	B
20	Q	15	B
25	A	1	M, N
30	F	4	N, Q
35	X	9	Q
40	C	9	Q
45	Y	9	A, F, X
50	S	6	F
55	J	5	X, F
60	T	10	C
65	V	5	Y, S
70	U	10	V, T, J

For the above given data,

(i) Construct a precedence diagram.

(ii) On the diagram, compute the four scheduled dates (ESD, EFD, LSD, LFD) and the four floats (TF, FF, INTF and IDF) for each activity, and the lag for each link.

(iii) Identify the critical path.

- |    |    |  |    |
|----|----|--|----|
| 5. | a. | Write a note on different sources of risks and risk identification techniques. | 7M |
|    | b. | Explicate different risk analysis methods.                                     | 7M |
| 6. | a. | With an example explain how to reduce the risks in project management.         | 7M |
|    | b. | What is the importance of quality control in project control?                  | 7M |
| 7. | a. | Summarize various cost accounting systems for project control.                 | 7M |
|    | b. | How to manage the changes that occur to the initial project?                   | 7M |
| 8. | a. | Write a note on project review meetings.                                       | 7M |
|    | b. | State the reasons for terminating the project.                                 | 7M |

**[B16ME4105]**

**[B16ME4106]**  
IV/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**NON-DESTRUCTIVE TESTING**  
**MECHANICAL ENGINEERING**  
MODEL QUESTION PAPER

**Time: 3 Hrs.**

**Max. Marks: 70**

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Question No. 1 compulsory.  
Answer any FOUR questions from the remaining.  
All Questions Carry equal marks  
All parts of a question must be answered at one place only.

1. Write short notes on the following:
  - a. What are the properties of a good penetrant? 2M
  - b. Name the materials which can be tested by magnetic particle testing? 2M
  - c. What is the basic principle of acoustic emission test? 2M
  - d. What are penetrameters in radiographic testing? Mention its uses. 2M
  - e. What is the equation for sound waves in a material? 2M
  - f. List out the application of NDT. 2M
  - g. Write a note on the importance of Eye in Visual testing? 2M
  
2.
  - a. Compare destructive and non-destructive testing. Describe various visual Inspection methods and tools used for non destructive testing. 7M
  - b. Explain the sequence of operation of Liquid penetrant testing. Differentiate fluorescent and visible dye penetrant. 7M
  
3.
  - a. Explain demagnetization in Magnetic particle testing? How do you ensure it? Portable Equipments used in MPT? 7M
  - b. Explain various methods of magnetisation & demagnetisation commonly practiced in Non-destructive testing procedure. 7M
  
4.
  - a. With neat sketch explain different probes and probe methods used in UT. 7M
  - b. Write short note on importance of penetrometer used in Radiography testing. 7M
  
5.
  - a. Classify Ultrasonic inspection methods. Explain through transmission technique. 7M
  - b. Explain types of scanning methods in Ultrasonic testing. 7M
  
6.
  - a. Explain the principle of Eddy current testing, benefits and applications. 7M
  - b. What are different types of test coils used in E.C.T. Explain their typical applications 7M
  
7.
  - a. Draw neat sketch of Normal, TR and Angle probes and standard test block used for ultrasonic testing. 7M
  - b. Differentiate X-rays and  $\gamma$  rays. 7M

8. a. Write important steps for selection of NDT methods. 7M  
b. Briefly discuss on different defects observed in materials during NDT 7M

**[B16ME4106]**

**[B16ME4107]**  
IV/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**POWER PLANT ENGINEERING**  
**MECHANICAL ENGINEERING**  
MODEL QUESTION PAPER

**Time: 3 Hrs.**

**Max. Marks: 70**

Question No. 1 compulsory.

Answer any FOUR questions from the remaining.

All Questions Carry equal marks

All parts of a question must be answered at one place only.

1. Write short notes on the following:
  - a. Name the four major circuits in steam power plant. 2M
  - b. What are the uses of air filter and superchargers in diesel engine power plant? 2M
  - c. Name two combined power cycles. 2M
  - d. What is the use of surge tank? 2M
  - e. Why shielding is necessary in Nuclear power plants. 2M
  - f. What is main objective of tariff? 2M
  - g. Explanation shortly for high energy prices in recent years. 2M
2.
  - a. What are the basic resources in India for power generation? List out their capacities in different regions. 7M
  - b. What are the basic coal ingredients? Explain their effects on furnace design. 7M
3.
  - a. Why supercharging is necessary in diesel plant? What are the methods used for supercharging the diesel engine? What are the advantages of supercharging as fuel consumption and overall efficiency of the plant are concerned? 7M
  - b. Discuss the essential components of the diesel power plant with neat layout. 7M
4.
  - a. What do you understand by a closed cycle gas turbine plant? List out its advantages over open cycle plant. What difficulties are encountered in the development of closed cycle gas turbine plant? 7M
  - b. Compare the merits and demerits of open and closed cycle gas turbine power plant. 7M
5.
  - a. What are the factors to be considered in selecting site for hydro electric power plant? 7M
  - b. What is hydrograph? Explain its importance in the design of storage type hydro electric power plant. 7M
6.
  - a. With a neat sketch explain the working of simple nuclear power plant. 7M
  - b. What do you understand by breeding? What factors control breeding? Explain. 7M
7.
  - a. Explain the construction and working of nuclear power plant with a layout. 7M
  - b. Draw a schematic diagram of a hydro plant and explain the operation. 7M

8. a. Explain any two methods of pollution in power plants. 7M  
b. What is tariff? Discuss with suitable examples of two part tariff and three part tariff. 7M

**[B16ME4107]**

**[B16ME4108]**  
IV/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**MECHATRONICS**  
**MECHANICAL ENGINEERING**  
MODEL QUESTION PAPER

**Time: 3 Hrs.**

**Max. Marks: 70**

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Question No. 1 compulsory.

Answer any FOUR questions from the remaining.

All Questions Carry equal marks

All parts of a question must be answered at one place only.

- |    |    |   |     |
|----|----|---|-----|
| 1. | a. | Define Lorentz's law.   | 2M  |
|    | b. | What is mechatronics.   | 2M  |
|    | c. | What are the quality parameters of an instrumentation system.                     | 2M  |
|    | d. | What are the basic types of stepper motors.                                       | 2M  |
|    | e. | Define time delays.   | 2M  |
|    | f. | What is the general classification of fluid power pumps.                          | 2M  |
|    | g. | What is a micro-thermal sensors.  | 2M  |
| 2. |    | Discuss in detail about mechatronics key elements with the help of block diagram. | 14M |
| 3. | a. | Explain analogies and impedance diagrams.   | 7M  |
|    | b. | What are fluid systems and explain about it.                                      | 7M  |
| 4. | a. | What are the different parameter measurements in sensors and transducers.         | 7M  |
|    | b. | Explain temperature measuring devices.  | 7M  |
| 5. | a. | Explain briefly about different forms of system representation.                   | 7M  |
|    | b. | Explain how a nonlinear function can be linearized in a block diagram.            | 7M  |
| 6. | a. | Discuss the elements of a data acquisition and control systems.                   | 7M  |
|    | b. | Explain the installation of I/O card and software.                                | 7M  |
| 7. | a. | Explain mechatronic controls in automated manufacturing.                          | 7M  |
|    | b. | Explain the artificial neural networks in mechatronics.                           | 7M  |
| 8. |    | Write short notes on any three of the following                                   | 14M |
|    | a. | Advanced approaches in mechatronics.  |     |
|    | b. | Micro sensor fabrication technique.   |     |
|    | c. | Brushless D.C. motors.  |     |
|    | d. | Electro mechanical couplings.   |     |

**[B16ME4108]**

**[B16ME4109]**  
IV/IV B.Tech. DEGREE EXAMINATION  
First Semester  
**DESIGN FOR MANUFACTURING**  
**MECHANICAL ENGINEERING**  
MODEL QUESTION PAPER

**Time: 3 Hrs.**

**Max. Marks: 70**

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Question No. 1 compulsory.  
Answer any FOUR questions from the remaining.  
All Questions Carry equal marks  
All parts of a question must be answered at one place only.

1. Write short notes on the following:
  - a. turning 2M
  - b. Non traditional machining process 2M
  - c. Sand casting 2M
  - d. shrinkage 2M
  - e. Visual inspection 2M
  - f. Fracture test 2M
  - g. Residual stress 2M
2.
  - a. What is DFMA? How the development of DFMA is been progressed? 7M
  - b. Differentiate between DFA, DFM and DFMA 7M
3.
  - a. List out and explain the effect of casting discontinuities on the properties of a casted product 7M
  - b. Briefly explain the design guidelines for extruded sections with neat sketches. 7M
4.
  - a. Discuss the general design recommendations for forging operation 7M
  - b. Explain the effect of thermal stress in weld joints. 7M
5.
  - a. Discuss the importance of pre and post treatment of welds. 7M
  - b. Sketch and explain how to choose parting line in forging design. 7M
6.
  - a. Briefly explain the factors that effect drawability 7M
  - b. Explain component design for blanking operation 7M
7.
  - a. Briefly discuss the product design considerations in machining with neat sketches. 7M
  - b. Discuss the applications of design for machining rules 7M

8. a. Write a brief note on Multi station assembly system 7M  
b. Write a brief note on Automated assembly system 7M

**[B16ME4109]**

**[B16ME4201]**  
IV/IV B.Tech. DEGREE EXAMINATION  
Second Semester  
**COMPUTER AIDED MANUFACTURING**  
**MECHANICAL ENGINEERING**  
MODEL QUESTION PAPER

**Time: 3 Hrs.**

**Max. Marks: 70**

Question No. 1 compulsory.

Answer any FOUR questions from the remaining.

All Questions Carry equal marks

All parts of a question must be answered at one place only.

1. Write short notes on the following:
  - a. Write the applications of NC machines 2M
  - b. What is group technology? List out any four benefits of GT? 2M
  - c. Define process planning. Why the retrieval CAPP system is called as variant CAPP system? 2M
  - d. List the differences between open loop and closed loop control system? 2M
  - e. What is the difference between contact and non-contact inspection methods? 2M
  - f. Write a short note on AGV's 2M
  - g. Define FMS& CIM 2M
2.
  - a. Explain the Optiz coding system generally used in group technology. 7M
  - b. Differentiate between Numerical Control (NC), Computer Numerical Control (CNC) and Direct Numerical Control (DNC) systems of CAM. 7M
3.
  - a. What is computer aided part programming? How does it help CAD/CAM Integration? 7M
  - b. Discuss the principle of variant process planning. What are its advantages? 7M
4.
  - a. Explain the working of typical robot with neat sketch consisting of various components of the robot. 7M
  - b. What for an 'Automated Guided Vehicle (AGV) is used? Describe the role of sensors in controllers. 7M
5.
  - a. What is the working principle of a computer vision system is as applied to quality control. 7M
  - b. Distinguish between contact inspection and non-contact inspection methods 7M
6.
  - a. Describe the steps involved in checking the using CMM dimensions of a typical component using CMM 7M
  - b. Briefly discuss Automation & CIM 7M
7.
  - a. What are the required considerations to be made for material handling system design 7M

- b. What for and automated guided vehicle (AGV) is used? Describe the role of sensors in controllers 7M
- 8. a. Discuss the major elements of FMS? 7M
- b. What is meant by palletization? Discuss the importance of palletization in FMS stations 7M

**[B16ME4201]**

**[B16ME4202]**  
 IV/IV B.Tech. DEGREE EXAMINATION  
 Second Semester  
**QUALITY CONTROL AND ASSURANCE**  
**MECHANICAL ENGINEERING**  
 MODEL QUESTION PAPER

**Time: 3 Hrs.**

**Max. Marks: 70**

Question No. 1 compulsory.

Answer any FOUR questions from the remaining.

All Questions Carry equal marks

All parts of a question must be answered at one place only.

1. Write short notes on the following:
  - a. What is a quality characteristic? Give examples. 2M
  - b. What do you mean by warning limits? 2M
  - c. Difference between R and  $\sigma$  chart. 2M
  - d. What is the difference between p and np charts? 2M
  - e. What is meant by PCR? What is its significance? 2M
  - f. Acceptance sampling versus 100% inspection. 2M
  - g. Define ASN and ATI. 2M
  
2. a. What do you mean by quality of design, quality of conformance and quality of performance? 7M
  
- b. What is Deming's philosophy? Explain. 7M
  
3. Prepare  $\bar{X}$  - R charts using the following measurements of surface roughness taken of 5 rough turned pieces. On each piece 5 measurements are taken along its length. These pieces have been picked up randomly from a lot of 50. 14M

Sample	Five measurements per sample (x)				
	1	2	3	4	5
1	10.5	10.17	10.16	10.18	10.16
2	10.17	10.19	10.14	10.11	10.17
3	10.16	10.14	10.15	10.17	10.15
4	10.19	10.18	10.17	10.15	10.16
5	10.14	10.16	10.15	10.14	10.17

State whether the process is under control or not.

4. A certain dimension is specified as  $6.644 \pm 0.004$ . Experience indicated that tool wear caused fairly steady trend in the average dimension of parts made on the required type of machining operation. The following values of  $\bar{X}$  and R were obtained from subgroups of 5 components taken from the machine at half an hour 14M

interval.

Subgroup	$\bar{X}$	R
1	0.6417	0.0011
2	0.6418	0.00160
3	0.6424	0.0010
4	0.6431	0.0015
5	0.6433	0.0009
6	0.6437	0.0010
7	0.6433	0.0014
8	0.6436	0.0004
9	0.6441	0.0006
10	0.6444	0.0011
11	0.6456	0.0009

Determine the equation of least square trend line fitted to the  $\bar{X}$  values, and plot on  $\bar{X}$ -chart using slopping  $3\sigma$  limits parallel to the trend line.

5. a. What are the objectives of p-chart? Outline the theory underlying control charts for fraction defective? 7M
- b. Twenty pieces of cloth out of different rolls contained respectively 1, 4, 3, 2, 5, 4, 6, 7, 2, 3, 2, 5, 7, 6, 4, 5, 2, 1, 3 and 8 defects. Ascertain whether the process is in a state of quality control 7M
6. a. What is process capability? How do you determine process capability? Explain 7M
- b. An assembly contains 3 parts joined lengthwise with the following lengths and standard deviations: 7M

Part no.	Average length (mm)	Standard
1	15.56	0.12
2	9.65	0.014
3	12.72	0.011

Find the standard deviation of the assembly. Assuming upper and lower specification limits at  $4\sigma$  distance from the average. Compute the specification for the assembly. Compare the values with the specification limits obtained from simple addition of the maximum and minimum allowable values of the parts.

7. a. Explain double sampling plan with a neat schematic. What are its advantages and disadvantages over Single sampling plan? 7M
- b. Design a single sampling plan which meet the producer's risk is defined by  $\alpha = 0.05$  for AQL = 0.9 and the consumer's risk is defined by  $\beta = 0.10$  for LTPD = 7.8. 7M

- (i) Keep the consumer's risk at 0.10 and producer's risk  $\leq 0.05$  but as near 0.05 as possible.
- (ii) Keep the producer's risk at 0.05 and consumer's risk as close 0.10 as possible
8. a. What is rectifying inspection and AOQL? Derive the expression for AOQ. 7M
- b. For the single sampling plan  $n = 300$ ,  $C = 5$  and  $N \gg n$ , determine OC curve and AOQ curve. 7M

**[B16ME4202]**