[M19 ST 1101]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

I M. Tech I Semester (R19) Regular Examinations

Theory of Elasticity

(Structural Engineering)

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75 M**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

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			CO	KL	M
		UNIT - I			
1.	a).	Write short notes on Generalized Hooke's law.	**1**	**2**	**7**
	b).	Derive expressions for stress at a point.	**1**	**2**	**8**
		OR			
2.	a).	Derive differential equations of equilibrium for rectangular plate.	**1**	**4**	**7**
	b).	Derive expressions for compatibility for a two dimensional problems.	**1**	**4**	**8**
		UNIT - II			
3.	a).	Explain Saint Venant's principle ?	**2**	**4**	**7**
	b).	Derive an expression for bending of a cantilever loaded at the end	**2**	**4**	**8**
		OR			
4.		Explain the application of fourier series for two dimensional problems?	**2**	**4**	**15**
		UNIT - III			
5.		Derive the general equation in polar coordinates	**3**	**4**	**15**
		OR			
6.		Discuss the effect of a circular hole on the stress distribution in a rectangular plate subjected to tensile stress in x-direction and hence evaluate the stress concentration factor	**3**	**4**	**15**
		UNIT - IV			
7.		Derive the system of equations generally sufficient for determining the stress components.	**4**	**4**	**15**
		OR			
8.		Write a short note on			
		a) Principle of superposition	**4**	**4**	**8**
		b) Uniqueness of solution	**4**	**4**	**7**
9.	a).	Explain the analogy of torsion	**5**	**4**	**7**
	b).	Explain with an example solution of torsional problems by energy method	**5**	**4**	**8**
		OR			
10.		Derive an expression for stretching a prismatic bar under its own weight	**5**	**4**	**15**

CO: Course Outcome

KL: Knowledge Level

M: Marks

[M19 ST 1102]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

I M. Tech I Semester (R19) Regular Examinations

STRUCTURAL DYNAMICS

(STRUCTURAL ENGINEERING)

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75 M**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

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			CO	KL	M
		UNIT - I			
1.	a).	A vertical cable 3m long has a cross section area of 4 cm^2 supports a weight of 50 KN. What will be the natural period and natural frequency of the system? $E=2.1x10^6$ kg/cm^2	2	K2	5M
	b).	Determine the natural frequency and natural period of the system consisting of a mass of 100 kg attached to a horizontal cantilever beam through the linear spring K_2. The cantilever beam has a thickness of 0.8 cm and a width of 1.2 cm. $E=2.1x10^6$, L=70 cm and k =10kg/cm	2	K2	10M
		OR			
2.	a).	Explain i) Degree of Freedom ii) Damping Structures	2	K2	8M
	b).	Explain Logarithmic decrement and derive Expression for the same	2	K2	7M
		UNIT - II			
3.	a).	Derive expression for response of SDOF system subjected to un damped free vibration	2	K2	10M
	b).	A single degree of freedom system having a mass of 2.5kg is set into motion with the viscous damping and allowed to oscillate freely. The frequency of oscillation is found to be 20 Hz and measurement of the amplitude shows two successive amplitudes to be 6 mm and 5.5 mm. Determine the viscous damping Coefficient.	2	K2	5 m
		OR			
4.	a).	A SDOF system consists of a mass 400kg and a spring stiffness of 300KN/m.By testing it was found that a force of 100N Produces a relative velocity 12 cm/s. Find a) damping ratio, b) damped frequency c) logarithmic decrement and d) ratio of two consecutive amplitudes	2	K2	5M
	b).	Derive expression for response of SDOF system subjected to damped free vibration	2	K2	10M
		UNIT - III			
5.	a).	Derive the equation of motion of Multi Degree freedom systems (MDOF)	3	K2	15M
		OR			
6.	a).	State and explain orthogonality principle of normal modes	3	K2	5M
	b).	A cantilever bar is to be modelled by a mass less uniform bar to which are attached with two lumped masses representing the mass of original system as k= 2AE/L and m=ρ AL. Determine the natural frequencies and the normal modes of this model	3	K2	10M
		UNIT - IV			
7.	a).	Explain Stodola method	4	K2	5M
	b).	Explain mode Superposition method	4	K2	10M

		OR			
8.	a).	Find the natural frequencies and sketch mode shapes for uniform beams simply supported at both ends	4	K2	10M
	b).	Explain Holzer method	4	K2	5M
		UNIT - V			
9.	a).	Explain the Lumped SDOF Elastic Systems, Translational excitation	5	K2	15M
		OR			
10.	a).	Explain the Generalised co ordinate SDOF Elastic Systems, Translational Excitation	5	K2	15M

CO: Course Outcome
KL: Knowledge Level
M: Marks

M19ST 1103]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

I M. Tech I Semester (R19) Regular Examinations

MATRIX METHODS OF STRUCURES (Elective-I)

(STRUCTURAL ENGINEERING)

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75 Marks**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

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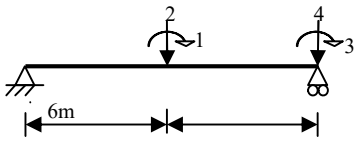
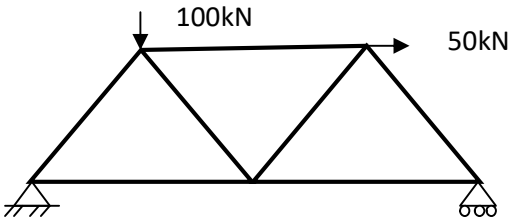
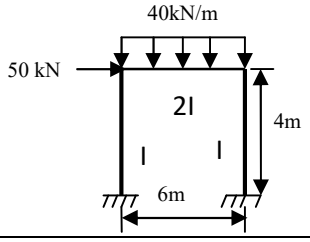
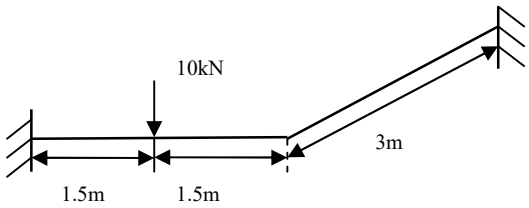
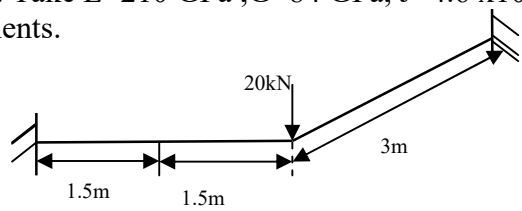
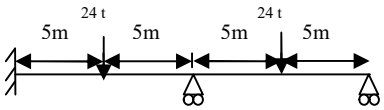
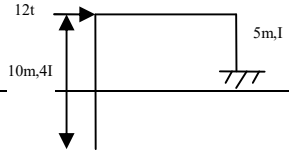
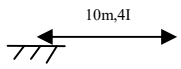
			CO	KL	M
		UNIT - I			
1.	a).	Explain degree of static indeterminacy and degree of kinematic indeterminacy of structure with examples?.	CO3	K2	7
	b).	Discuss the procedure to develop Element stiffness matrix for truss element, beam element and Torsional element	CO1	K2	8
		(OR)			
2.	a).	Explain 'Structural Idealization'	CO1	K2	5
	b).	Develop stiffness matrix for the given beam? 	CO1	K6	10
		UNIT - II			
3.	a).	Analyse the pin jointed truss given in figure below. Take E =2 x 10^5 N/mm^2, A=450 mm^2 and L= 3000 mm for all elements. Use stiffness matrix method. 	CO2	K4	10
	b).	Compare the force and displacement methods for the analysis of continuous beams.	CO4	K4	5
		(OR)			
4.	a).	Analyse and draw the bending moment diagram for portal frame. Use stiffness matrix method. 	CO2	K4	10
	b).	Discuss about the stiffness of the pin jointed and rigid jointed frame	CO4	K3	5

		UNIT - III			
5.	a).	Derive Stiffness matrix for a grid element.	CO3	K4	5
	b).	Formulate Stiffness matrix for the grid shown . EI = constant & GJ =constant for both the member. Take GJ = 0.8 EI. 	CO4	K6	10
		(OR)			
6.	a).	Analyse the grid structure ABC as shown in figure using stiffness matrix method. Take E=210 GPa ,G=84 GPa, J=4.6 x10^{-5} m^4, I=16.6 x $10^{-5}m^4$ for all elements. 	CO4	K4	10
	b).	Explain procedure for analysis of curved beam element in vertical plane deriving stiffness formulation	CO3	K2	5
		UNIT - IV			
7.	a).	Explain Banded matrix and semi band width. Give examples how band width can be reduced with nodal numbering scheme.	CO3	K2	7
	b).	Explain Method of static condensation	CO3	K2	8
		(OR)			
8.	a).	Explain the procedure for incorporating Support Displacements	CO3	K2	7
	b).	Explain the analysis of Beams on Elastic Foundations	CO3	K2	8
		UNIT - V			
9.	a).	Explain the steps involved in the analysis of continuous beams with and without settlement.	CO3	K2	5
	b).	Analyse the beam shown in the figure, if the download settlements of supports B and C in t-m units are $\frac{200}{EI}$ and$\frac{100}{EI}$ respectively. 	CO3	K4	10
		(OR)			
10.	a).	Explain the analysis of gable frame by flexibility method using system approach	CO1	K2	5
	b).	Analyse the portal frame shown in figure ,if the yielding of the support D to the right and down wards in t-m units are $\frac{20}{EI}$ and $\frac{50}{EI}$ respectively 	CO3	K4	10

CO: Course Outcome
KL: Knowledge Level
M: Marks

[M19 ST 1104]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

I M. Tech I Semester (R19) Regular Examinations

ANALYTICAL& NUMERICAL METHODS FOR STRUCTURAL ENGINEERING

(STRUCTURAL ENGINEERING)

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75 M**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

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			CO	KL	M
		UNIT - I			
1.	a).	Using the Laplace transform method solve the Initial Boundary Value Problem (IBVP) described as PDE $\frac{\partial^2 u}{\partial t^2} = \frac{1}{c^2}\frac{\partial^2 u}{\partial t} - \cos \omega t$; $0 \le x < \infty$, $0 \le t < \infty$. Also given boundary conditions areu(0, t) =0, u is bounded as x →∞. Initial condition u_t (x,0) = u(x, 0) = 0.	CO1	K3	12
	b).	Write the Laplace transform of $\{\frac{1}{\sqrt{t}}\}$.	CO1	K2	3
		OR			
2.	a).	A string is stretched as fixed between two points (0, 0) & (l , 0). Motion is initiated by displacing the string in the form of $u = \lambda \sin(\frac{\prod x}{l})$ and released from rest at time $t = 0$. Find the displacement of any point on the string at any time t.	CO1	K3	12
	b).	State the heat conduction problem in semi – infinite rod.	CO1	K2	3
		UNIT - II			
3.	a).	Using the Fourier transform method solve the solution of 2D Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, is valid in the half - plane , y > 0 , is subjected to the condition U (x, 0) = 0 if x< 0, u (x, 0) = 1 if x > 0 and $\lim_{x^2+y^2 \to \infty} u(x, y) = 0$ in the half plane.	CO2	K3	12
	b).	Write the change of scale property of Fourier transforms	CO2	K2	3
		OR			
4.	a).	Find the curves on which the functional $\int_0^1 (y_1^{\,2} + 12xy)\,dx$ withy(0) = 0 and y(1) = 1 can be extremised.	CO2	K3	7
	b).	Show that the curve which extremises the functional $I = \int_0^{\frac{\pi}{4}} [(y'')^2 - y^2 + x^2]\,dx$ under the conditions	CO2	K3	8
		UNIT - III			
5.	a).	Verify that u(x) = x e^x is a solution of the Voltaerra Integral equation $u(x) = \sin x + 2\int_0^x \cos(x-t)u(t)dt$	CO3	K2	8

	b).	Convert $\frac{d^2y}{dx^2}+xy=1$, y(0) = 0, y(1) = 1 into an integral equation	CO3	K2	7
		OR			
6.	a).	Find the Eigen values and Eigen functions of the Integral Equation $u(x)=\lambda\int_0^1 e^{x+t}u(t)dt$	CO3	K2	8
	b).	Solve the homogeneous Fredholm Integral equation of second kind $u(x)=\lambda\int_0^{2\pi}\sin(x+t)u(t)dt$	CO3	K2	7
		UNIT - IV			
7.	a).	From the following table, estimate the number of students who obtain marks between 40 and 45. Marks: 30-40, 40-50, 50-60, 60-70, 70-80 No. of Students: 31, 42, 51, 35, 31	CO4	K2	7
	b).	Find by Teylor's series method the value of y at x = 0.1 and x = 0.2 to five places of decimals from $\frac{dy}{dx}=x^2y-1$, y(0) =1	CO4	K2	8
		OR			
8.	a).	A beam of length *l*, supported at *n* points carries a uniform load *w* per unit length. The bending moments $M_1, M_2, M_3, \ldots, M_n$ at the supports satisfy the Clapeyron's equation: $M_{r+2}+M_{r+1}+M_r=\frac{1}{2}wl^2$. If a beam weighing 30 kg is supported at its ends and at two other supports dividing the beam into three equal parts of 1 meter length, show that the bending moments at each of the two middle supports is 1 kg meter.	CO4	K3	8
	b).	The deflection of Beam is given by the equation $\frac{d^4y}{dx^4}+81y=\phi(x)$, where φ(x) is: x: 1/3, 2/3, 1 φ(x): 81, 162, 243 And boundary condition $y(0)=y^1(0)=y^{11}(1)=y^{111}(1)=0$. Evaluate the deflection at the pivotal points of the beam using three sub intervals.	CO4	K3	7
		UNIT - V			
9.	a).	Given Values x: 5, 7, 11, 13, 17 f(x): 150, 398, 1492, 2366, 5202 Evaluate f(9) using Lagrange Formula	CO5	K2	8
	b).	Use the Composite Trapezoidal Rule with m = n = 2 to evaluate the double integral $\int_0^{1/2}\int_0^{1/2} e^{x-y}dxdy$	CO5	K3	7
		OR			

10.	a).	Use the Composite Simpson's Rule with n = 2 and m = 4 to evaluate the double integral $\int_0^1 \int_x^{2x} \left(x^2 + y^3\right) dy dx$	CO5	K3	7
	b).	Apply New Marks Method with suitable example	CO5	K3	8

CO: Course Outcome
KL: Knowledge Level
M: Marks

[M19 ST 1105]
SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)
I M. Tech I Semester (R19) Regular Examinations
DESIGN OF REINFORCED CONCRETE FOUNDATIONS
STRUCTURAL ENGINEERING
MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75 Marks**

Answer **ONE Question** from **EACH UNIT**
All questions carry equal marks
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			CO	KL	M
		UNIT - I			
1.	a).	Explain the design requirements of the foundation.	CO1	K4	5
	b).	Design a concrete pedestal for supporting a steel column carrying a total factored load of 1700kN. The size of the base plate is 300 mm square. Assume grade 25 concrete and Fe 415 steel.	CO2	K6	10
		(OR)			
2.	a).	Explain the general procedure for design of square or rectangular footing.	CO2	K4	5
	b).	A solid footing has to transfer a dead load of 1000kN and an imposed load 400kN from a square footing 400 X 400 mm (with 16 mm bars). Assuming $f_y = 415$ N/mm^2,$f_{ck} = 20$ N/mm^2,and safe bearing capacity to be 200 KN/m^2 .Design the footing.	CO2	K6	10
		UNIT - II			
3.	a).	Explain the types of foundations of partitions walls in ground floors	CO1	K4	5
	b).	A brick wall of 250mm thick of a two-storeyed building is to rest directly on a R.C strip footing. Design the footing assuming the soil is sandy and its safe bearing capacity to be 100kN/mm^2.	CO2	K6	10
		(OR)			
4.	a).	Explain the different methods of analysis of continuous strip footing for un symmetric loading.	CO1	K4	5
	b).	A series of five columns is to be supported on a 20m x 2m strip foundation. Determine the Shear force and Bending moment for design. Assume safe bearing capacity as 100kN/m^2. The loads are 300,350,400,450 and 500kN at 2,7.5,11.5,15,18 m from one end.	CO2	K5	10
		UNIT - III			
5.	a).	Explain about the rigid and Flexible Foundations.	CO1	K4	7½
	b).	Explain about the deflection requirements of beams and slabs in rafts.	CO3	K4	7½
		(OR)			
6.	a).	Explain the different types of raft foundation.	CO3	K4	5
	b).	Design a flat slab raft with edge beam for a layout of column loads by Direct Design Method. Assume the safe bearing capacity from settlement considerations as 50kN/m^2.Assume columns are 300 x 300 mm enlarged to 600 x 600 mm as capital	CO4	K6	10
		UNIT - IV			
7.	a).	Discuss about the estimation of settlement of piles in detail	CO3	K3	5
	b).	A bored pile of total length 13.2 m is with enlarged base has a shaft diameter of			

		600 mm and in the last 1.2m, it is enlarged to 1200 mm diameter. If the SPT (*N)* value of clay in which the shaft is installed is 13 and that of the enlarged portion is 15, estimate the settlement at the ultimate load of the pile.	CO3	K5	10
		(OR)			
8.	a).	Explain about the conventional analysis of annular rafts.	CO4	K4	5
	b).	The load from a circular water tank supported by six columns rests on a ring beam, which in turn, rests on an annular raft. Assuming the mean radius of the centres of column line is 8m and the total load from the tank is 30,000kN. Design the ring beam.	CO2	K6	10
		UNIT - V			
9.	a).	Explain about the significance of under-reamed piles for expansive soils.	CO3	K4	5
	b).	The main brick wall of a room of a residential building is 225 mm thick and has a loading of 40kN/m at the foundation level. Another cross wall of the same thickness joins it and transmits a concentrated load of 35 kN. Design a layout of under reamed piles and grade beam for the foundation of the main wall	CO3	K6	10
		(OR)			
10.	a).	Discuss about the significance of Earth pressure on rigid walls	CO1	K5	5
	b).	Design a cantilever retaining wall with level backfill to retain 4 m of earth (ϕ =30º) of unit weight of 19 kN/m^2	CO2	K6	10

CO: Course Outcome
KL: Knowledge Level
M: Marks

[M19 ST 1106]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

I M. Tech I Semester (R19) Regular Examinations

BRIDGE ENGINEERING

STRUCTURAL ENGINEERING

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75 M**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

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			CO	KL	M
		UNIT - I			
1.	a).	Identify different types of loads on a concrete bridge according to IRC.	1	K3	7
	b).	Make use of general design requirements in design of concrete bridges.	1	K3	8
		OR			
2.	a).	Identify different types of bridges.	1	K3	7
	b).	Organize distribution of concentrated loads in design of deck slabs.	1	K3	8
		UNIT - II			
3.		Distinguish betweenPigeauds method and Hendry-Jaugar method.	2	K4	15
		OR			
4.		A reinforced concrete T beam bridge is to consist of 5 beams 1.75 m apart. The span of the bridge is 12m clear with end bearings of 600 mm. The live load on the bridge 17kN/m^2 including impact. The carriageway over the bridge is to be 7 m wide with a footpath of 1.5 m width on other side. The loading on the footpath may be taken as 3.9 kN/m^2. Design the bridge. Use M20 grade concrete and Fe415 steel.	2	K4	15
		UNIT - III			
5.		Design a reinforced concrete box culvert having a clear vent way of 3m x 3m. The superimposed dead load on the culvert is 12.8 kN/m^2. The live load is estimated as 50 kN/m^2. Density of soil at site is 18 kN/m^3. Angle of repose is 30^0. Adopt M20 grade concrete and Fe415 steel. Sketch the details of reinforcement in the box culvert. The design should conform to the specifications IRC: 112-2011.	2	K4	15
		OR			
6.		Design a reinforced concrete box culvert with inside dimensions 3m height and 4.5 m width. The box culvert has to carry a superimposed load of 10 kN/m^2 and a live load of 50 kN/m^2. The density of soil is 20kN/m^3. Angle of repose is 30^0. Adopt M20 grade concrete and Fe415 steel. Sketch the details of reinforcement in the box culvert.	2	K4	15
		UNIT - IV			
7.		Design an un-stiffened welded plate girder with THICK web, for a simply supported bridge with a clear span of 24 m, subjected to a factored bending moment 4800 kN-m and factored Shear force 1000 kN. The girder carries two factored moving loads of 180 kN each spaced at 2 m center to centre. The plate girder is restrained laterally and prevented from rotation.	4	K4	15

		OR			
8.		Design an un-stiffened welded plate girder with THIN web, for a simply supported bridge with a clear span of 24 m, subjected to a factored bending moment 4800 kN-m and factored Shear force 1000 kN. The girder carries two factored moving loads of 180 kN each spaced at 2 m center to centre. The plate girder is restrained laterally and prevented from rotation.	4	K4	15
		UNIT - V			
9.		Design a pipe culvert through a road embankment of height 8 m. The width of the roadis7.5 m and the formation width is 10 m. The side slope of the embankment is 1.5:1.Themaximum discharge is $6m^3/s$. The safe velocity is 4 m/s. Class AA tracked vehicleis tobe considered as live load. Assume bell-mouthed entry. Given C_e =1.5, C_S = 0.010andthe unit weight of the soil = 20 kN/m^3.	5	K4	15
		OR			
10.		Design suitable RCC non pressure pipe culvert to suit the following data: Discharge through pipe culvert= 1.57 m3/s, Velocity of flow through pipe= 2 m/s, Width of road= 7.5m, Bed level of stream= 100 m, Top of embankment= 103 m, Top width of embankment= 1.5:1 Loading is IRC class AA wheel load of 62.5 kN Draw longitudinal section, plan and end view of pipe culvert	5	K4	15

CO: Course Outcome
KL: Knowledge Level
M: Marks

[M19 ST1107]
SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)
I M. Tech I Semester (R19) Regular Examinations
REPAIR & REHABILTATION OF STRUCTURES
(Civil Engineering)
MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75 M**

Answer **ONE Question** from **EACH UNIT**
All questions carry equal marks
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			CO	KL	M
		UNIT - I			
1.	a).	Categorise the materials used for repair	1	K4	7
	b).	Distinguish between visual investigation methods.	1	K4	8
		OR			
2.	a).	Distinguish between Glass fiber wraps and carbon fiber wraps.	1	K4	7
	b).	Examine non-destructive evaluation and its importance.	1	K4	8
		UNIT - II			
3.	a).	Classify structural concrete strengthening.	2	K4	7
	b).	Categorise methods of repair of cracks.		K4	8
		OR			
4.	a).	Examine beam shear capacity strengthening, shear transfer strengthening and stress reduction techniques.	2	K4	7
	b).	Award column strengthening, flexural strengthening and connection stabilization.		K5	8
		UNIT - III			
5.		Discover the bonded installation techniques.	2	K4	15
		OR			
6.		Contrast the fundamental de-bonding mechanisms.	2	K4	15
		UNIT - IV			
7.	a).	Examine the mechanical properties of fiber-reinforced concrete.	4	K4	7
	b).	Discover the applications of fiber-reinforced concrete.			8
		OR			
8.	a).	Discover the properties and reaction mechanism of fly ash-modified concrete.	4	K4	7
	b).	Examine the durability of fly ash-modified concrete.			8
		UNIT - V			
9.		Theme of the high performance concrete.	4	K4	15
		OR			
10.		Theme of Self-compacting concrte.	4	K4	15

[M19 ST 1108]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

I M. Tech I Semester (R19) Regular Examinations

ADVANCED REINFORCED CONCRETE DESIGN

(STRUCTURAL ENGINEERING)

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75 M**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

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			CO	KL	M
		UNIT - I			
1.	a).	Analyse and Check the suitability to reduce the maximum moment at support B by 30% and redistribute to the spans of a T-beam ABC which is continuous over two spans of 8m each and it carries a factored UDL of 75 kN/m. Assume M25 concrete and Fe415 steel are used. The T-beam flange width = 1000 mm, web thickness = 300 mm, slab thickness = 150 mm, Overall depth D= 820 mm and effective depth d= 770 mm. Also design the sections for maximum positive and negative moments.	1	K4	15
		OR			
2.	a).	Compute the values at salient points on the stress-strain curve of concrete in bending of an unconfined concrete member if cylindrical strength of concrete used is f'_c=25 N/mm^2. If such a concrete is confined in a section of (b x D) 300 x 500 mm with a clear cover of 50mm with 10mm stirrups at 100 mm c/c, compute the stress-strain curve for inelastic analysis of the structure. Use the relation f'_c=0.8 f_{ck}	1	K4	15
		UNIT - II			
3.	a).	Analyse and design a slab isosceles in shape using yield line analysis by equilibrium method. The slab sides are 4m, 4m and 3m and simply supported in 4m sides with free end on 3m. The slab carries an imposed load of 2 kN/m^2 and finishes 1.5 kN/m^2. Use M20 concrete and Fe 415 grade steel.	2	K4	15
		OR			
4.	a).	Analyse and design a square slab of size 4m x 4m which is continuous on all four sides, using yield line analysis by Virtual work method. The slab carries an imposed load of 3 kN/m^2 and finishes 1.0 kN/m^2. Use M25 concrete and Fe 415 grade steel.	2	K4	15
		UNIT - III			
5.	a).	Analyse& Design a flat plate supported on columns spaced at 6000m in both directions. The size of columns is 500 x 500mm and the imposed load on panel is 4.4 kN/m^2; Floor height is 4m; Floor finish is 1.4kN/m^2. Assume Fe 415 grade steel & M25 concrete. Exposure is severe	3	K5	15
		OR			

6.		Analyse& Design a flat plate with suitable column head supported on circular columns spaced at 7200m in both directions. Diameter of columns is 600mm and the imposed load on panel is 4kN/m^2; Floor height is 3.6m; Floor finish is 1 kN/m^2. Assume Fe 415 steel & M35 concrete. Exposure is mild	3	K5	15
		UNIT - IV			
7.	a).	Compute the thickness and reinforcements for a simply-supported transfer girder of length 6000mm loaded from two columns at 1.50m from each end with load 5kN. The total depth of beam is 3600mm and the width of supports is 500. Assume Fe 415 grade steel & M25 concrete			15
		OR			
8.	a).	Analyse& Design a deep beam with an opening for the following data. Span = 5000mm; Girder subjected to two point loads of each 4kN acting at 1.25m from supports; Total depth of beam is 3000mm; Width of supports is 450mm; Assume Fe 415 grade steel & M20 concrete. Width and depth of opening is 150 x 250mm; Location of bottom of opening from bottom of beam is 1800mm.	4	K4	15
		UNIT - V			
9.	a).	Compute the maximum factored axial load carrying capacity of the slender column using additional moment method, given that the column is braced against sideway and has an unsupported height of 7.00m. The column cross section is 500 x 300 mm with a clear cover of 40mm and reinforced with three 25mm dia bars on each longer face and 8mm lateral ties. Assume effective length ratios $k_x = k_y = 0.85$. Use M25 concrete and Fe 415 steel.	4	K4	15
		OR			
10.	a).	Design the longitudinal reinforcement for a braced column, 300 x 400 mm, subjected to a factored load of 1500 kN and factored moments of 60 kNm and 40 kNm w.r.t. major and minor axis respectively at the top end. Assume that the is bent in double curvature (in both directions) with the moments at the bottom end are equal to 50% of the corresponding moments at top. Assume an unsupported height of 7.00m and an effective length ratio of 0.85 in both directions. Use M30 concrete and Fe 415 steel.	5	K5	15

CO: Course Outcome
KL: Knowledge Level
M: Marks

[M19 ST 1109]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

I M. Tech I Semester (R19) Regular Examinations

ADVANCED CONCRETE TECHNOLOGY

(CIVIL ENGINEERING)

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75 M**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

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			CO	KL	M
		UNIT - I			
1.	a).	What are the factors promoting the alkali-aggregate reaction? Explain any two of them?	CO1	1	8
	b).	State the importance of using Admixtures in concrete and explain Plasticizers-Super plasticizers?	CO1	2	7
		OR			
2.	a).	What are Bogues compounds? Explain them by stating their importance in concrete?	CO1	2	8
	b).	Explain the classification and gradation of aggregates?	CO1	2	7
		UNIT - II			
3.	a).	What is Workability? State various tests on Workability and explain any two tests in detail.	CO2	1	8
	b).	Define the terms Segregation, Bleeding, Creep and Shrinkage of concrete?	CO2	1	7
		OR			
4.	a).	What is NDT testing of concrete? Explain any two NDT tests?	CO2	1	8
	b).	Define Abrams Law and Gel space ratio? State their major differences in determination of concrete strength?	CO2	1	7
		UNIT - III			
5.	a).	Differentiate high strength concrete from high performance concrete?	CO3	4	8
	b).	Explain the requirements and properties of high performance concrete?	CO3	5	7
		OR			
6.	a).	Explain the design procedure of HSC Using ErintroyShaklok method?	CO3	5	8
	b).	Explain briefly about ultra-high strength concrete?	CO3	5	7
		UNIT - IV			
7.	a).	Design the concrete mix for M25 grade of concrete for the following data using DOE method a. Compressive strength for 28 days = 25 N/mm2 b. Standard deviation = 4 N/mm2 c. Nominal cover to steel reinforcement = 30mm d. Maximum size of Coarse Aggregates = 20mm e. Aggregates are Uncrushed type f. Degree of workability, Slump = 60mm g. Type of exposure : Moderate h. Cement : Sulphate Resisting Portland Cement (specific gravity - 3.15) i. Specific gravity of Fine aggregate and Coarse aggregate = 2.7	CO4	6	8

		j. Fine aggregate is confined to Zone: II of Table 4: IS 383-1970 k. Coarse Aggregates: 20mm MSA (78%) & 10mm MSA (22%)			
	b).	Explain the step wise Procedure for IS mix design in detail?	CO4	5	7
		OR			
8.	a).	What is polymer concrete? Explain its types?	CO4	1	8
	b).	State the importance of FRC over conventional concrete?	CO4	1	7
		UNIT - V			
9.	a).	What is a form work? Explain its importance in construction?	CO3	1	8
	b).	List out various connections in form work and explain with neat sketches?	CO3	5	7
		OR			
10.	a).	State and explain different form works?	CO3	2	8
	b).	Explain the design of form work?	CO3	5	7

CO: Course Outcome
KL: Knowledge Level
M: Marks

[M19 ST 1201]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

I M. Tech II Semester (R19) Regular Examinations

STRUCTURAL ENGINEERING

FINITE ELEMENT METHODS IN STRUCTURAL ENGINEERING

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75 M**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

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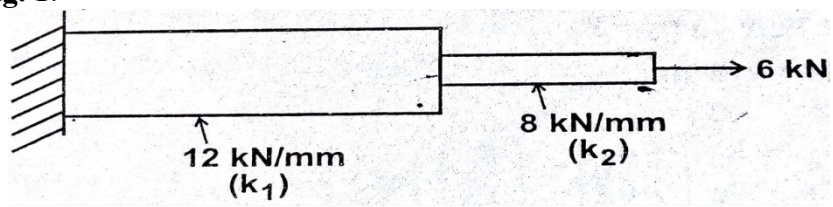
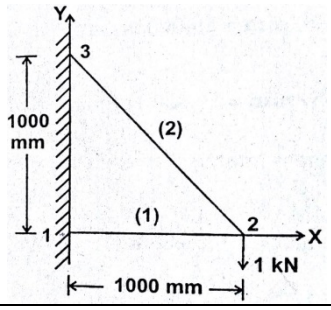
			CO	KL	M
		UNIT - I			
1.	a).	Explain about Rayleigh-Ritz method.	1	1&2	2
	b).	Determine the deflection at the center of a simply supported beam of span 'L', subjected to uniformly distributed load of w/unit length throughout its length by using Rayleigh-Ritz method.	1	3	13
		OR			
2.	a).	Explain aboutWeighted residual methods.	1	1&2	5
	b).	Solve the differential equation for a physical problem expressed as $$\frac{d^2y}{dx^2} + 100 = 0, 0 \le x \le 10$$ with boundary conditions as y(0) = 0 and y(10) = 0 by using i) Pont collocation method, ii) Sub-domain collocation method, iii) Least squares method and iv) Galarkin's method.	1	3	10
		UNIT - II			
3.		Determine the nodal displacements and forces for the bar loaded as shown in **Fig. 1**.  **Fig. 1**	2	3	15
		OR			
4.		A truss structure is subjected to a load of 1 kN as shown in **Fig. 2**. Determine the nodal displacements and forces if the element stiffness of the truss is 10 kN/mm.  	2	3	15

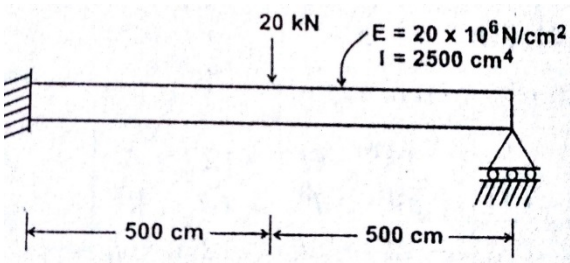
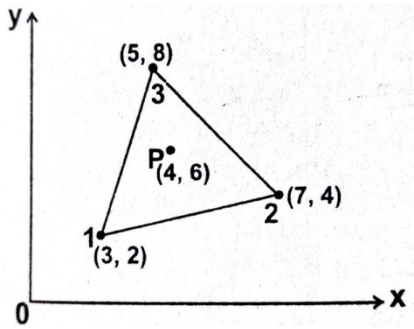
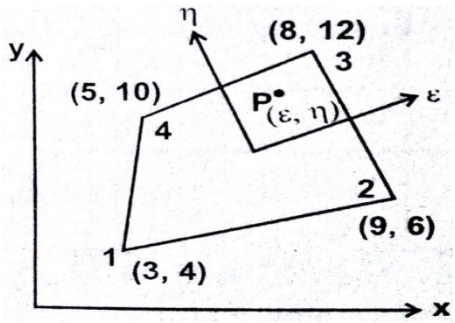
		Fig. 2			
		UNIT - III			
5.		Develop stiffness matrix for beam.	2	3	15
		OR			
6.		A beam, fixed at one end and supported by a roller at the other end, has a 20 kN concentrated load applied at the center of the beam, as shown in **Fig. 3**. Determine the deflection under the load and also construct the shear force and bending moment diagrams for the beam.  **Fig. 3**	2	3	15
		UNIT - IV			
7.	a).	Develop shape functions for CST element.	3	3	5
	b).	Determine the shape functions at the interior point 'P' for the triangular element shown in **Fig. 4**.  **Fig. 4**	3	3	10
		OR			
8.		Develop shape functions for axisymmetric triangular element.	3	3	15
		UNIT - V			
9.	a).	Define Isoparametric, super parametric and sub-parametric elements.	3	1	2
	b).	Determine the Cartesian coordinates of the point 'P' which has local coordinates $\varepsilon = 0.8$ and $\eta = 0.6$ as shown in **Fig 5**. 	3		13

		Fig. 5			
		OR			
10.		Develop shape functions for a four noded quadrilateral isoparametric element.	3	3	15

[M19 ST 1202]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

I M. Tech II Semester (R19) Regular Examinations

STRUCTURAL ENGINEERING

THEORY OF PLATES AND SHELLS

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75 M**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

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			CO	KL	M
		UNIT - I			
1.		Derive the differential equation governing the plate. Sate various assumptions involved in the derivation.	**1**	**3**	**15**
		OR			
2.	a).	Using the Navier solution obtain general equation for a rectangular plate subjected to hydrostatic pressure	**1**	**3**	**7**
	b).	Obtain the modified equation in case of a plate subjected to in plane forces.	**1**	**3**	**8**
		UNIT - II			
3.		Derive expressions for deflection, shear force and bending moment for a circular plate with simply supported boundary conditions subjected to uniformly distributed loading.	**2**	**3**	**15**
		OR			
4.		Obtain the expression for deflection in case of uniformly loaded circular plates with clamped edges.	**2**	**3**	**15**
		UNIT - III			
5.	a).	How do you classify shells into long and short shells as per various theories	**3**	**3**	**7**
	b).	Write boundary conditions for simply supported cylindrical shells with the edge conditions or the end shells in a multiple group of shells.	**3**	**3**	**8**
		OR			
6.	a)	Derive the equations of equilibrium of membrane theory for cylindrical shells	**3**	**3**	**8**
	b)	A simply supported circular cylindrical shell with free longitudinal edges is spanning 22m and radius of 10m and semicircular angle of 35 degrees. The edge beam has width of 300mm and depth of 1500mm. Determine stress resultants for NX N0 Nx0 under self weight using membrane theory. If there is an edge beam what is the maximum longitudinal force developed in the edge beam.	**3**	**3**	**7**
		UNIT - IV			
7.	a)	Derive Shorer's differential equation	**4**	**3**	**8**
	b)	Give solutions to Shorer's differential equations	**4**	**3**	**7**

		OR			
8.		Design a cylindrical shell roof considering beam and arch action to cover a parking place 40 meters wide and 160 meters long. Superimposed load due to waterproofing cover and occasional live loads may be taken as 350 kg/m2 of the surface of the shell. Slope at the ends may be taken as 40. Thickness of the shell may be taken as 110mm.Dimensions of the edge beam may be assumed as 300mm by 1500 mm. Shell may be divided into four parts for arch action. Use M20 and Fe250 steel. Show the design details clearly.	**4**	**3**	**15**
		UNIT - V			
9.	a).	Derive geometrical relations for shells of double curvature.	**5**	**3**	**7**
	b).	Derive the governing differential equation for the membrane analysis of shells of double curvature.	**5**	**3**	**8**
		OR			
10.		Explain design procedure of elliptic paraboloid by membrane theory.	**5**	**3**	**15**

[M19 ST 1203]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

I M. Tech II Semester (R19) Regular Examinations

STRUCTURAL ENGINEERING

STABILITY OF STRUCTURES

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

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			CO	KL	M
		UNIT - I			
1.	a).	Develop the basic differential equation of a beam-column subjected to general lateral loadings.	1	6	7
	b).	A beam column is subjected to compressive force at the ends in addition to moments at the two ends which produce zero slopes at the two ends. Develop an expression for 1) the deflection curve 2) Maximum deflection, 3) Maximum moment.	1	6	8
		(OR)			
2.	a).	Develop expression for the maximum deflection and maximum moment of a beam column whose ends are built in and that is loaded with a concentrated load at midspan.	1	4	7
	b).	Develop expression for the maximum deflection and maximum moment of a beam column whose ends are simply supported and that is load uniformly distributed load at midspan.	1	6	8
		UNIT - II			
3.	a).	Determine the crippling load of a column with one end fixed and the other hinged by using higher order differential equation.	2	6	5
	b).	Obtain an expression for the mid height deflection of an initially bent column with ends hinged.	2	6	10
		(OR)			
4.	a).	What is double modulus theory? A column of rectangular cross section, hinged at ends is acted up on by an axial load ‘ P’. Using the double modulus theory deduce an expression for buckling load.	2	4	5
	b).	Derive the expression on effect of shear force on critical load	2	5	10
		UNIT - III			
5.	a).	Derive expression for critical load of cantilever column under a constant load ‘P’ using Rayleigh-Ritz method.	3	5	8
	b).	Explain principle of conservationofenergy.	3	5	7
		(OR)			
6.	a).	Derive expression for critical load of fixed-hinged column under a constant load ‘P’ using Galerikin’s method.	3	5	5
	b).	Calculate the critical load for a column fixed at both ends of length ‘l’ and constant ‘EI’usingenergyprinciple.	3	5	10

		UNIT - IV			
7.	a).	Explain the mode of buckling	4	3	5
	b).	A portal frame fixed at base has its lengths of members (L) and flexural rigidity (EI) the same for all its three members. Using natural equilibrium method, find the buckling load for the frame for symmetric buckling mode.	4	5	10
		(OR)			
8.	a).	Explain the load deflection behaviour of frame	4	4	5
	b).	A portal frame hinged at base has its lengths of members (L) and flexural rigidity (EI) the same for all its three members. Using natural equilibrium method, find the buckling load for the frame for symmetric buckling mode.	4	5	10
		UNIT - V			
9.	a).	Derive the critical stress expression of lateral buckling of rectangular beam in pure bending.	5	4	5
	b).	Derive the expression for warping displacements in thin walled open cross sections.	5	6	10
		(OR)			
10.	a).	Explain Uniform torsional buckling of thin walled members of open cross section.	5	5	7
	b).	Explain Non-uniform torsional buckling of thin walled members of open cross section.	5	5	8

[M19 ST 1204]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

I M. Tech II Semester (R19) Regular Examinations

ADVANCED STEEL DESIGN

STRUCTURAL ENGINEERING

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

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			CO	KL	M
		UNIT - I			
1.	a).	Write the advantages of welded joints over bolted joints.	CO1	K6	7
	b).	Design a double cover butt joint to connect two plates, each 12 mm thick and 300 mm wide. The service load to be transferred is 200 kN.	CO1	K6	8
		(OR)			
2.	a).	Write about the load-transfer mechanism in bolted joints.	CO1	K4	7
	b).	Design a fillet weld to join a tension member consisting of 2 ISA 100 mm × 75 mm × 8 mm to a 12 mm thick gusset plate. The factored tensile load is 410 kN.	CO1	K6	8
		UNIT - II			
3.	a).	Derive the moment curvature relationship for a rectangular section subjected to flexure.	CO2	K6	5
	b).	A rigid beam is hung by wires of cross section A as shown in Fig 1. It is subjected to a load P. Compute the load at first yield and ultimate load P_u. Also compute the reserve strength of the structure.	CO2	K6	10
		(OR)			
4.	a).	State the following theorems of plastic collapse: (1) static theorem (2) kinematic theorem and (3) uniqueness theorem.	CO2	K4	5
	b).	A fixed base rectangular portal frame is of height and span 'L'. The columns each have full plastic moment '2Mp', and the beam has full plastic moment 'Mp'. One of the columns is subjected to a uniformly distributed horizontal load 'w' per unit run. Find the value of 'w_u' which would cause collapse. Sketch BMD.	CO2	K5	10
		UNIT - III			
5.	a).	Design a bolted bracket connection to support an end reaction of 400 kN because of the factored loads supported by the beam. The eccentricity of the end reaction is as shown in the Fig. The steel used is of grade Fe410. Use both of grade 4.6. The thickness of bracket plate may be taken as 10 mm. The column section is ISHB 150 @ 300.19 N/m.	CO3	K5	15
		(OR)			
6.		An ISLB 300 @ 369.8 N/m transmits an end reaction of 385kN, under factored loads, to the web of ISMB 450 @ 710.2 N/m, design a bolted	CO3	K5	15

		framed connection. Steel is of grade Fe410 and bolts are of grade 4.6.			
		UNIT - IV			
7.		Design an I-section purlin, for an industrial building situated in the outskirts of Allahabad, to support a galvanized corrugated iron sheet roof for the following data. Spacing of the truss c/c = 6.0m Span of truss = 12.0m Spacing of purlins c/c = 1.5m Intensity of wind pressure =2kN/m^2 Weight of galvanized sheets = 130 N/m^2 Grade of steel = Fe410	CO4	K3	15
		(OR)			
8.		Design channel section purlins for an industrial building roof for the following data. Distance between c/c of trusses = 5.0 m Distance between c/c of purlins = 1.60 m Inclination of the roof surface to the horizontal =30degree Weight of G.I sheets = 133.1N/mm	CO4	K4	15
		UNIT - V			
9.		Design a through type truss girder bridge to carry a single track B.G(revised) loading, for the following data Effective span – 39.0 m c/c spacing of stringers – 1.90 m Sleepers and their spacings – 250 mm ×150 mm ×2.8 m @ 0.4 m c/c Density of timber – 7.4 kN/m^3 Weight of stock rails – 0.44 kN/m (90 lb/yard rails) Weight of guard rails – 0.26 kN/m Weight of fastenings etc – 0.28 kN/m of track	CO5	K5	15
		(OR)			
10.		Design the top lateral bracing and bottom lateral bracing for the through type truss girder bridge for problem 8.	CO5	K5	15

[M19 ST 1206]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

I M. Tech I Semester (R19) Regular Examinations

STRUCTURAL ENGINEERING

EARTH QUAKE RESISTANT DESGIN OF BUILDINGS

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75**

Answer ONE Question from EACH UNIT
All questions carry equal marks
Use of (IS1893) and (IS 13920) Permitted
Assume relevant additional Data where ever required

			CO	KL	M
		UNIT - I			
1.	a.	What is plate tectonic theory of origin of earthquakes and explain associated type of movement at the plate boundaries	CO1	K2	10M
	b.	How are earthquakes classified based on different aspects	CO1	K2	5M
		OR			
2.	a.	Explain the characteristics of different types of seismic waves	CO1	K2	8M
	b.	Explain the concept of elastic rebound theory with a neat sketch	CO1	K2	7M
		UNIT - II			
3.		What are plan configurations and explain torsional irregularity, Re-entrant corners and Non parallel lateral force system	CO2	K3	15M
		OR			
4.	a.	Explain the limitations in adoption of in-fill wall with example in a moment resisting frame.	CO2	K3	8M
	b.	Explain Storey drift, Importance factor and damping ratio	CO2	K3	7M
		UNIT - III			
5.		Explain concept of strong column and weak beam	CO3	K4	8M
		Sketch the detailing of beams and column as per IS 13920	CO3	K4	7M
		OR			
6.		The following details are available for a multi-storey moment resisting building. Compute the lateral forces developed at various levels using IS Code 1893-2002. Number of stories =8, Constant β=1.2. Basic horizontal seismic coefficient α=0.055.Importance Factor I=1.0. Performance Factor K=1.0.load at each i_{th}floor $W_{i=}$500 KN. Height of each i_{th}floor H_i=3.3m	CO3	K4	15M
		UNIT-IV			
7.		Explain the behaviour of pre-stressed concrete, Reinforced concrete elements under cyclic loading	CO4	K4	15M
		OR			
8.	a.	Explain the base isolation and advantage of adoption of base isolation in buildings	CO4	K4	10M
	b.	Define seismic dampers and explain different types of dampers	CO4	K4	5M
		UNIT-V			
9.	a.	What are factors that are affecting building damages due to earthquake	CO5	K3	8M

	b.	Explain Seismic retrofitting method with a sketch by an addition of shear wall	CO5	K3	7M
		OR			
10.	a	Discuss various types of damages in RC buildings subjected to earthquake forces	CO5	K3	8M
	b.	Discuss damages to structural elements under seismic excitations	CO5	K3	7M

[M19 ST 1207]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

I M. Tech II Semester (R19) Regular Examinations

STRUCTURAL OPTIMIZATION TECHNIQUES

STRUCTURAL ENGINEERING

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

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			CO	KL	M
		UNIT - I			
1.	a).	How the optimization problems classified and describe them briefly.	CO1	K3	7
	b).	Explain the statement of an optimization problem.	CO1	K3	8
		(OR)			
2.	a).	What are objective function contours?	CO1	K3	7
	b).	What is the difference between design variables and pre-assigned parameters?	CO1	K3	8
		UNIT - II			
3.		Minimize $f(x)=1/2(x_1^2+x_2^2+x_3^2)$ Subjected to $g_1(x)=x_1-x_2=0$ $g_2(x)=x_1+x_2+x_3-1=0$ By (i) direct substitution (ii) Language multiplier method.	CO2	K4	15
		(OR)			
4.	a).	State and explain Khun-Tucker conditions for optimality.	CO2	K4	5
	b).	Maximize $Z=4x_1+6x_2-2x_1^2-2x_1x_2-2x_2^2$ Subjected to the constraints $x_1+x_2=2$ *and* x_1,x_2 0.Use Khun-Tucker conditions.	CO2	K5	10
		UNIT - III			
5.	a).	Define Fibonacci numbers. What is the difference between Fibonacci and golden section methods.	CO3	K4	7½
	b).	Find the minimum of $f = \lambda^5 - 5\lambda^3 - 20\lambda + 5$ by the quadratic interpolation method	CO3	K4	7½
		(OR)			
6.		Minimize $f(x)=x_1^2+x_2^2-6x_1-8x_2+10$ Subjected to $4x^2+x_1^2\leq 16$ $3x_1+5x_2\leq 15$ $x_1\geq 0, i=1,2$ By using the Zoutendijk's method with the starting point $x_1 = \begin{Bmatrix} 1 \\ 1 \end{Bmatrix}$	CO3	K4	15
		UNIT - IV			
7.	a	Maximize $f = 4x_1 + 2x_2$	CO4	K3	15
		Subject to			

		$x_1 - 2x_2 \geq 2$ $x_1 + 2x_2 = 8$ $x_1 - x_2 \leq 11$ $x_1 \geq 0, \quad x_2\ unrestricted\ in\ sign$ (a) Write the dual of this problem. (b) Find the optimum solution of the dual.			
		(OR)			
8.		Write the dual of the following linear programming problem: Maximize $f = 50x_1 + 100x_2$ Subject to $2x_1 + x_2 \leq 1250$ $2x_1 + 5x_2 \leq 1000$ $2x_1 + 3x_2 \leq 900$ n=2, m=4 $x_2 \leq 150$ Where $x_1 \geq 0\ and\ x_2 \geq 0.$	CO4	K4	15
		UNIT - V			
9.	a).	Maximize $Z=2x_1-x^2+x_2$ subjected to $2x_1 3x_2 \leq 9$, $x_1,x_2 \geq 0$ where x_1 and x_2 are both integers, by dynamic programming.	CO5	K4	10
	b).	Explain normality condition in geometric programming.	CO5	K3	5
		(OR)			
10.	a).	How many state variables are to be considered if an L.P problem with n variables and m constraints is to be solved as dynamic programming problem?	CO5	K4	7
	b).	Solve the following L.P problem by programming: Maximize $f(x_1, x_2) = 10x_1 + 8x_2$ Subject to $2x_1 + x_2 \leq 25$ $3x_1 + 2x_2 \leq 45$ $x_2 \leq 10$ $x_1 \geq 0\ and\ x_2 \geq 0.$	CO5	K4	8

[M19 ST 1208]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

I M. Tech I Semester (R19) Regular Examinations

EARTH RETAININGSTRUCTURES

STRUCTURAL ENGINEERING

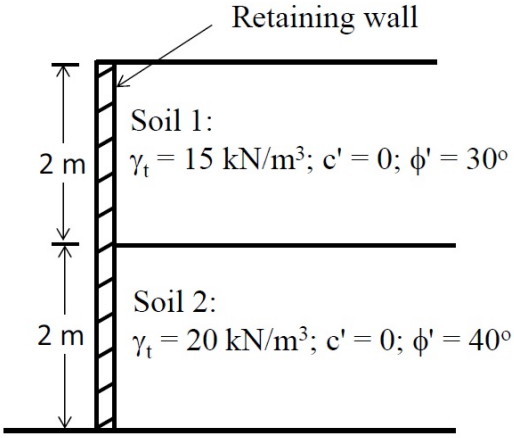
MODEL QUESTION PAPER

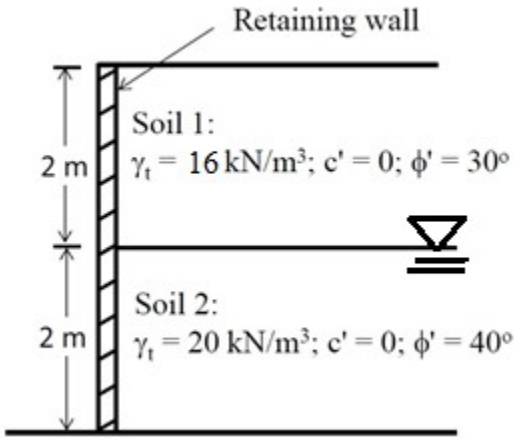
TIME: 3 Hrs. **Max. Marks: 75 M**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

*****

			CO	KL	M
		UNIT - I			
1.	a)	Explain the differences between Rankine's and Coulomb's theories of earth pressure	1	2	7
	b)	Two different soil types (Soil 1 and Soil 2) are used as backfill behind a retaining wall as shown in the figure, where γ_t is the total unit weight, and c' and φ' are effective cohesion and effective angle of shearing resistance. Determine the resultant active earth force per unit length (in kN/m) acting on the wall. 	1	3	8
		OR			
2.	a)	Two different soil types (Soil 1 and Soil 2) are used as backfill behind a retaining wall as shown in the figure, where γ_t is the total unit weight, and c' and φ' are effective cohesion and effective angle of shearing resistance. The water table is at depth of 2m below ground level. Determine the resultant active earth force per unit length (in kN/m) acting on the wall.	1	3	8

					
	b)	Explain Culmann's Method for determining active earth pressure in cohesionless soil.	1	2	7
		UNIT - II			
3.	a)	Briefly explain different types of failures of retaining walls.	2	2	7
	b)	A cantilever retaining wall is to be constructed to retain a backfill of height 6m, having c = 0, Ø = $33^0$and γ = 18 kN/m^3. The bearing capacity of the foundation soil is 250 kN/m^2. Check the stability of retaining wall.	2	3	8
		OR			
4.	a)	Explain different types of retaining walls and their general proportions for the design.	2	2	7
	b)	A counterfort retaining wall is to be constructed to retain a backfill of height 10m, having c = 0, Ø = $43^0$and γ = 20 kN/m^3. The bearing capacity of the foundation soil is 300 kN/m^2. Check the stability of retaining wall.	2	3	8
		UNIT - III			
5.	a)	Explain various types of fills used in reinforced earth structures?	3	2	8
	b)	Explain the various theories of reinforced earth?	3	2	7
		OR			
6.		Check for the stability of a reinforced earth retaining wall of 6 m height, having 0.5 m embedment into foundation soil. The width of the wall is 3.5 m. The properties of the backfill are ϕ = 32^0, γ = 18.5 kN/m^3 and properties of fill material are ϕ = 33^0, γ = 19 kN/m^3. The wall is reinforced with GRP strips of 8 cm width and the reinforcement is placed with horizontal and vertical spacing of 0.5 m and 0.8 m respectively. The strip has a tensile strength of 45 kN and interfacial friction angle of 32^0. Take coefficient of friction at the base of the wall as 0.4.	3	3	15
		UNIT - IV			
7.	a)	Explain various types of anchoring systems used in anchored sheet pile walls?	4	2	7
	b)	An anchored bulkhead retains cohesion less backfill up to a height of 6.0 m above the dredge line. The average properties of soil, both above and below dredge line are as follows: γ = 18.5 kN/m^3, γ_{sat} = 20 kN/m^3, Ø = 28^0. The positions of water table and anchor rod are at 3 m and 2m below ground level respectively. Determine the depth of embedment of the bulkhead and the force in the anchor rod by the equivalent beam method. Take i/H = 0.07.	4	3	8

		OR			
8.		Derive the expression for depth of embedment for sheet pile in cohesionless soils with neat sketch of earth pressure diagram?	4	2	15
		UNIT - V			
9.	a)	What is a Braced cut? When is it preferred? Mention various components of Braced cut.	5	2	7
	b)	It is required to construct a braced excavation up to a depth of 5 m in stiff clay having a unit weight of 19kN/m^3 and an unconfined compressive strength of 140 kN/m^2. Bracing systems consisting of struts and Wales are to be installed at 1.2 m, 3 m and 4.5 m below ground level. Determine the strut forces and maximum bending moment in the Wales?	5	3	8
		OR			
10.	a)	Explain various types of coffer dams with neat sketches?	5	2	7
	b)	A braced excavation is to be carried out up to a depth of 6 m in stiff clay having a unit weight of 20 kN/m^3 and an unconfined compressive strength of 150 kN/m^2. Bracing systems consisting of struts and Wales are to be installed at 1.3 m, 3 m and 4.6 m below ground level. Determine the strut forces and maximum bending moment in the Wales?	5	3	8

[M19 ST 2101]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

II M. Tech I Semester (R19) Regular Examinations

STRUCTURAL ENGINEERING

DESIGN OF PRE- STRESSED CONCRETE STRUCTURES

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

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			CO	KL	M
		UNIT – I			
1.	a).	Explain the concept of load balancing.	CO1	K6	3
	b).	A concrete beam of symmetrical I-section spanning 8 m has width and thickness of flanges equal to 200 and 60 mm respectively. The overall depth of beam is 400 mm. The thickness of web is 80 mm. the beam is prestressed by a parabolic cable with an eccentricity of 150 mm at the centre and zero at the supports with an effective force of 100 kN. The live load on the beam is 2 kN/m. draw the stress distribution diagram at the central section for; (a) Prestress + Self weight(density of concrete=24 kN/m) (b)Prestress + Self weight+ Live load.	CO1	K6	12
		(OR)			
2.	a).	Explain various losses in pre-tensioned and post-tensioned members.	CO1	K4	5
	b).	A pre-tensioned beam of rectangular cross-section, 150 mm wide and 300 mm deep, is prestressed by 8-7 mm wires located 100 mm from the soffit of the beam. If the wires are initially tensioned to a stress of 1100 N/mm^2,Calculate their stress at transfer and the effective stress after all losses; given the following data Up to time of transfer Total Relaxation of steel $35 N/mm^2$ $70 N/mm^2$ Shrinkage of concrete 100×10^{-6} 300×10^{-6} Creep co-efficient ----- 1.6 $E_s=210 kN/mm^2$ $E_c=31.5 kN/mm^2$	CO1	K6	10
		UNIT – II			
3.	a).	Explain the factors influencing deflections	CO2	K6	3
	b).	A prestressed beam of rectangular section, 100 mm wide and 200 mm deep, has a straight duct 25 mm by 40 mm with its centre located at 50 mm from the soffit of the beam which is prestressed by 12 wires of 7 mm diameter stressed to 600 N/mm^2.The beam supports an imposed load of 4 kNm over a span of 6 m. The modulus of elasticity of concrete is 38 $kNmm^2$ .Estimate the central deflection of the beam under the action of prestress, self weight and live load. (a) Based on net section(beam ungrouted)	CO2	K6	12

		(b) Based on transformed section (beam grouted)			
		(OR)			
4.	a).	Explain the Indian code method as per IS:1343-1980	CO2	K4	5
	b).	A pretensioned prestressed concrete beam having rectangular section 150 mm wide by 350 mm deep has an effective cover of 50 mm. if A_p=461 mm^2 ,f_{ck}=40N/mm^2, and f_p=1600N/mm^2. Calculate the ultimate flexural strength of the section using IS:1343 code specifications.	CO2	K5	10
		UNIT – III			
5.	a).	Explain the advantages of composite members and types of composite members.	CO3	K5	5
	b).	A precast pre-tensioned beam of rectangular section has a breadth of 100 mm and a depth of 200 mm. The beam, with an effective span of 5 m, is prestressed by tendons with their centroids coinciding with the bottom kern. The initial force in the tendons is 1500kN. The loss of prestress may be assumed to be 15 per cent. The beam is incorporated in a composite T-beam by casting a top flange of breadth 400 mm and thickness 40 mm. If the composite beam supports a live load of 8kN/m^2 , calculate the resultant stresses developed in the precast and in situ cast concrete assuming the pre-tensioned beam as: (a)unpropped, and (b)propped during the casting of the slab. Assume the same modulus of elasticity for concrete in precast beam and in situ cast slab.	CO3	K5	10
		(OR)			
6.	a).	Explain the flexural strength and shear strength of composite sections	CO3	K5	3
	b).	The cross-section of a composite beam is of T-section having a pretensioned rib, 80 mm wide and 240 mm deep, and in situ cast slab, 350 mm wide and 80 mm thick. The pre-tensioned beam is reinforced with eight wires of 5 mm diameter with an ultimate tensile strength of 1600 N/mm^2 located 60 mm from the soffit of the beam. The compressive strength of concrete in the in situ cast and precast elements is 20 and 40 N/mm^2 respectively. If adequate reinforcements are provided to prevent shear failure at the interface, estimate the flexural strength of the composite section.	CO3	K5	12
		UNIT – IV			
7.	a)	The floor slab of an industrial structure, spanning over a8 m is to be designed as a one-way prestressed concrete slab with parallel post-tensioned cables. The slab is required to support a live load of 10kN/m^2 with the compressive and tensile stress in concrete at any stage not exceeding 14 and zero N/mm^2 respectively. Design a suitable thickness for the slab and estimate the maximum horizontal spacing of the Freyssinet cables (12 of 5 mm diameter initially stressed to 1200 N/mm^2) and their position at mid san section. The loss ratio is 0.8.	CO4	K3	11
	b).	Explain the advantages of concrete poles	CO4	K5	4
		(OR)			

8.	a).	Explain the advantages of concrete piles	CO4	K4	4
	b).	The columns of an industrial building are supported on prestressed concrete piles of 8 m length. Each pile is subjected to an axial load of 4000kN. The permissible effective prestress is not to exceed 5N/mm^2 .Design a suitable pile of square cross section. Also design the number of strands of (7-15.2 mm) required for the piles if the ultimate tensile strength of the strand is 260 kN. Assume cylinder compressive strength of concrete as 40 N/m^2	CO4	K5	11
		UNIT – V			
9.	a).	Explain the effect of prestressing in indeterminate structures	CO5	K4	3
	b).	A two –span continuous beam ABC (AB=BC=10m) is of rectangular section, 200 mm wide and 500 mm deep. The beam is prestressed by a parabolic cable, concentric at end supports and having an eccentricity of 100 mm towards the soffit of the beam at centre of spans and 200 mm towards the top of beam at mid support B. The effective force in the cable is 500kN. (a)Show that the cable is concordant (b) locate the pressure line in the beam when it supports an imposed load of 5.6 kN/m, in addition to its self weight.	CO5	K6	12
		(OR)			
10.	a).	Explain the stress distribution in end block	CO5	K5	3
	b).	A prestressing force of 250 kN is transmitted through a distribution plate 120 mm wide and 120 mm deep, the centre of which is located at 100 mm from the bottom of an end block having a section 120 mm and 300 mm deep. Evaluate the position and magnitude of the maximum tensile stress on horizontal section passing through the centre of the distribution plate using the methods of (a) Magnel (b) Guyon and (c) Rowe. Find the area of the steel necessary to resist the largest tensile force resulting from any of these methods. Yeild stress in steel =260 N/mm^2	CO5	K5	12

[M19 ST 2102]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

II M. Tech I Semester (R19) Regular Examinations

STRUCTURAL ENGINEERING

RELAIBILITY ANALYSIS AND DESIGN

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

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<table>
<tr><th></th><th></th><th></th><th>CO</th><th>KL</th><th>M</th></tr>
<tr><td></td><td></td><td>UNIT – I</td><td></td><td></td><td></td></tr>
<tr><td>1.</td><td>a).</td><td>Samples of soil are collected from various depths below ground level and tested in the laboratory to determine their shear strength .The collected field data are given below
<table>
<tr><td>Depth (m)</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>Shear Strength (kN/m^2)</td><td>14.8</td><td>20.3</td><td>32.2</td><td>39.0</td><td>42.0</td><td>56.4</td></tr>
</table>
Determine the sample covariance and correlation coefficient between depth of soil and its shear strength. What do you infer?</td><td>CO1</td><td>K6</td><td>10</td></tr>
<tr><td></td><td>b).</td><td>Explain need for reliability analysis.</td><td>CO1</td><td>K6</td><td>5</td></tr>
<tr><td></td><td></td><td>(OR)</td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td>a).</td><td>What do you understand by uniform reliability in structures ?</td><td>CO1</td><td>K4</td><td>7</td></tr>
<tr><td></td><td>b).</td><td>What factors affect the probability of failure of a structures ?</td><td>CO1</td><td>K6</td><td>8</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>UNIT – II</td><td></td><td></td><td></td></tr>
<tr><td>3.</td><td>a).</td><td>It is given that the ratio of the mean value of the cube strength of M15 concrete to its characteristic strength is 1:4 and the coefficient of variation of the strength of the concrete is 0.18. Determine the allowable stress for the probability of failure equal to $10^{-3.}$</td><td>CO2</td><td>K4</td><td>15</td></tr>
<tr><td></td><td></td><td>(OR)</td><td></td><td></td><td></td></tr>
<tr><td>4.</td><td>a).</td><td>The yield strength of steel follows the log normal distribution with $\mu = 295.3$ N/mm^2 and $\sigma = 16.24$ N/mm^2. If the specified strength of steel is 235 N/mm^2. Determine the characteristic strength of steel.</td><td>CO2</td><td>K4</td><td>15</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>UNIT – III</td><td></td><td></td><td></td></tr>
<tr><td>5.</td><td>a).</td><td>Explain Monte Carlo method?</td><td>CO3</td><td>K5</td><td>5</td></tr>
<tr><td></td><td>b).</td><td>The strength of an axially loaded short column is given by $R = 0.67\ CA_c + A_s$</td><td>CO3</td><td>K5</td><td>10</td></tr>
</table>

		Where C is the cube strength of concrete, F the yield strength of the reinforcing bars, A_c the area of concrete and A_s the area of steel. Given: Size of the column= 250 mm × 500 mm $\mu_c = 19.54$ N/mm^2 $\sigma_C = 4.1$ N/mm^2 $\mu_F = 469$ N/mm^2 $\sigma_F = 46.9$ N/mm^2 $A_s = 1250$ mm^2 C and F are normally distributed. The problem is to determine the distribution of R using the Monte Carlo method.			
		(OR)			
6.	a).	A reinforced concrete beam of an effective span 8 m is subjected to live load. The cross section has been designed with M 25 concrete and steel grade Fe 250.The area of steel is 1400 mm^2 and the self-weight of the beam is 3 kN/m. It is given that the random variables the cube strength of concrete f_{ck} and yield strength of steel f_y are normally distributed Breadth of beam (b) = 240 mm Effective depth of beam(d) = 480mm Mean value of f_{ck} = 30.28 MPa Mean value of f_y = 320 MPa SD of f_{ck} = 4.5 MPa SD of f_y = 32.0 MPa Calculate the probability of failure of the beam if the live load (L) is normally distributed with mean 6 kN/m and standard deviation 3 kN/m.	CO3	K5	15
		UNIT – IV			
7.	a)	Determine the reliability index of a simply supported I beam at the limit state of shear. The beam is subjected to a point load Q at mid span. It is given that μ_Q= 4000N σ_Q = 1000 N μ_{fs}= 95MPa σ_{fs} = 10 MPa σ_d = 2.5 mm d/tw = 40 μ_d= 50 mm Where d is the depth of the beam, $t_w$thickness of web, f_s isthe shear strength of the material. The coefficient of variation of $t_w$is negligible.	CO4	K3	15
		(OR)			
8.	a).	Calculate the reliability index for a steel tension member having tensile strength R subjected to a load ϕ. Given μ_R= 280 MPaσ_R = 28 MPa μ_Q= 5000 N σ_Q = 2000 N μ_D= 6 mm σ_D = 0.6 mm The member's circular in Cross section.	CO4	K4	15
		UNIT – V			
9.		A simply supported steel beam (RSJ) of span 8 m is designed for the following data:	CO5	K4	15

Variable	Mean /Nominal	Nominal value	δ	Distribution
X_1: Yield strength of steel	1.10	250 N/ mm^2	0.10	normal

		X_2: Dead load	1.05	11.0 N/mm	0.10	normal			
		X_3: Live load	0.70	12.0 N/mm	0.40	normal			
		Determine the partial safety factors for the design variables X_i if the target reliability is 4.0.							
		(OR)							
10.	a).	For the same question No.9 , what are the values of the partial safety factors with respect to (i) the mean values and (ii) the characteristic values. (iii) combined load factor?					CO5	K5	7
	b).	Consider the same question No.9. Determine the partial safety factors for β=4, if the yield strength of steel(X_1) and live load (X_3) follow the lognormal and Type 1 external (largest) distribution respectively.					CO5	K5	8

[M19 ST 2103]

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)

II M. Tech I Semester (R19) Regular Examinations

INDUSTRIAL STRUCTURES

STRUCTURAL ENGINEERING

MODEL QUESTION PAPER

TIME: 3 Hrs. **Max. Marks: 75**

Answer **ONE Question** from **EACH UNIT**

All questions carry equal marks

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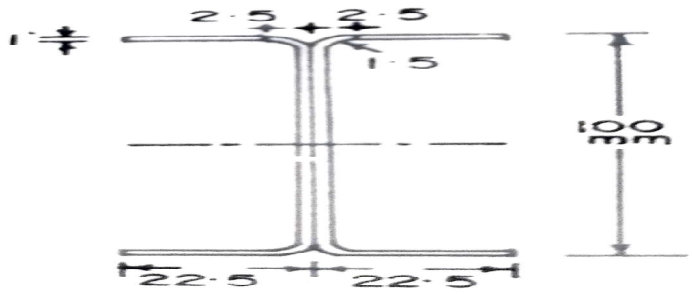
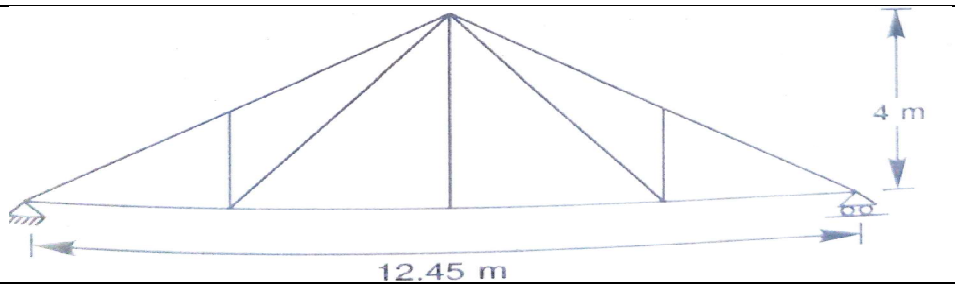
			CO	KL	M
		UNIT – I			
1.	a).	Explain the classification of industries?	CO 1	K6	7
	b).	Write the general requirements of different types of industries for safety?	CO 1	K6	8
		(OR)			
2.	a).	Explain the planning for layout requirements regarding lighting, ventilation and fire safety?	CO 1	K4	7
	b).	Explain Guidelines from factories act?	CO 1	K6	8
		UNIT – II			
3.		Determine the safe load carrying capacity of a column having rectangular box section 20 mmx100 mm. The internal radius at corners is 2 mm. Thickness is 2mm. The effective length of the column is 3 m. Take basic design stress 125 N/mm^2.	CO 2	K4	15
		(OR)			
4.	a).	Two channels 200 mm × 80 mm with bent lips are connected with webs to act as column. The thickness of plate is 2.5 mm and the depth of lip is 25 mm. Internal radius at curvature is 5.5 mm. Determine the safe load carrying capacity if the effective length of column is 4 m. Take f_y=235MPa	CO 2	K4	15
		UNIT – III			
5.	a).	Two channel sections without bent lips 200mmx50mm are connected with webs to act as a beam. The thickness of channel is 2.5mm. The effective span of simply supported beam is 3.6 m. Determine the load inclusive of self -weight that may be allowed on the beam. The beam is laterally supported throughout the span. Take fy=235N/mm^2.	CO 3	K5	15
		(OR)			
6.	a).	The beam having cross-section shown in Fig. is laterally supported at 1 m interval. Taking $M_1 = -0.7M_2$, $f_y = 236\,N/m^2$ and $E = 2 \times 10^6\,N/m^2$, compute the moment of resistance of the section.	CO 3	K5	15

					
		UNIT – IV			
7.	a).	A 60 m high microwave antenna lattice tower is to be built at Visakhapatnam. The diameter of hemi-spherical antenna disc, provided at the top is 3m. The minimum width of square platform is 3.0 m. Select a suitable truss configuration and determine the maximum forces in the legs of the tower and base shear. Assume any missing data appropriately.	CO 4	K4	15
		(OR)			
8.	a).	A self-supporting steel chimney is of height 60m above the foundation. The diameter of the cylindrical part of the chimney is equal to 3m. Design the plates for the chimney. The thickness of brick lining is 100 mm.The topography at the site is flat and the location is of terrain category2. The chimney is located in Hyderabad.	CO 4	K4	15
		UNIT – V			
9.	a).	Design a gantry girder for a mill building to carry an electric overhead travelling crane, having the following data: Crane capacity =300kN Weight of crane excluding crab = 200 kN Weight of crab =50 kN Span of crane between rails =14m Minimum hook approach =1.2m Wheel base =3.2m Span of gantry girder =8m Weight of rail section =0.3 kN/m Height of rail section =75mm Take fy=250 N/mm^2 and E=2x105 N/mm^2.	CO 5	K4	15
		(OR)			
10.	a).	Analyze a steel roof truss shown in Fig. for a clear span of 12 m. The truss is supported over masonry columns 45 cm × 45 cm. The trusses are placed 3 m c/c and support galvanised iron sheet on rafters and steel purlins. The rise of the truss is 1/3 of span. The design wind pressure may be 1000 N/m^2.	CO 5	K5	15

		 4 m 12.45 m			