LASERS AND FIBER OPTICS

1) The emission of photon without being aided by any external agency is called

A) light amplification **B)** induced absorption **C)** stimulated emission **D)** Spontaneous emission

2) The life time of an atom in a metastable state is of the order of

A) a few seconds   **B)** unlimited time   **C)** a nanosecond   **D)** few milliseconds

3) The relation between Einstein's coefficients A_{21} and B_{21} is, $\dfrac{A_{21}}{B_{21}}$ =

A) $\dfrac{8\pi h v^3}{c^3}$ **B)** $\dfrac{8\pi h \mu^3}{c^3}$ **C)** $\dfrac{8\pi h v^3 \mu^3}{c^3}$ **D)** $\dfrac{8\pi v^3 \mu^3}{c^3}$

4) In He-Ne laser, the ratio of He to Ne gas molecules is of the order of

A) 1 : 10   **B)** 1 : 1   **C)** 10 : 1   **D)** 100 : 1

5) Pumping technique used in He-Ne gas laser is

A) forward bias   **B)** optical pumping   **C)** electric discharge   **D)** none of these

6) Important characteristic of laser beam is

A) interference   **B)** diffraction   **C)** dispersion   **D)** coherence

7) The population of the various energy levels of a system in thermal equilibrium is given by

A) Boltzmann distribution law   **B)** Einstein relations   **C)** Planck's law   **D)** Beer's law

8) The color of the laser output from a Ruby laser is

A) green   **B)** blue   **C)** red   **D)** violet

9) Example for creation of population inversion by optical pumping is

A) He-Ne laser   **B)** Diode laser   **C)** Ruby laser   **D)** CO_2 laser

10) He-Ne gas laser is

A) pulsed laser   **B)** semiconductor laser   **C)** solid state laser   **D)** continuous laser

11) The unit of Planck's constant is

A) second   **B)** watt   **C)** joule-second   **D)** metre-second

12) The active medium in Ruby laser consists of particles of

A) Al^{3+} **B)** Cr^{3+} **C)** Fe^{3+} **D)** none

13) Propagation of light through optical fibre core is due to

A) diffraction   **B)** interference   **C)** total internal reflection   **D)** refraction

14) In an optical fiber if n_1 is the refractive index of core and n_2 the refractive index of cladding, then

A) $\dfrac{n_1-n_2}{n_1}<1$ **B)** $\dfrac{n_1-n_2}{n_1}>1$ **C)** $\dfrac{n_1-n_2}{n_1}=0$ **D)**

$\dfrac{n_1-n_2}{n_1}=\infty$

15) In the case of an optical fiber, the acceptance angle is equal to

A) $\sin^{-1}\left(\sqrt{n_1^2-n_2^2}\right)$ **B)** $\sin^{-1}\left(n_1^2-n_2^2\right)$ **C)** $\sin^{-1}\left(n_1-n_2\right)$ **D)** $\sin\left(\sqrt{n_1^2-n_2^2}\right)$

16) The total internal reflection takes place when a light ray travels from

A) denser to rarer medium   **B)** rarer to denser medium   **C)** denser to denser medium   **D)** none

17) The expression for numerical aperture in terms of fractional refractive index change is

A) $NA=n_1\sqrt{2\Delta}$ **B)** $NA=\sqrt{2\Delta n_1}$ **C)** $NA=\dfrac{n_1}{\sqrt{2\Delta}}$ **D)** none

18) The variation of refractive index of the core in graded index fiber is

A) linear   **B)** a parabola   **C)** constant   **D)** none

19) Holography technique is employed to produce
A) Gratings   **B)** Lasers   **C)** Stimulated emission   **D)** Three dimensional photographs

20) Energy 'E' of a photon having wavelength "λ" is

A) $\dfrac{hc}{\lambda}$ B) $hc\lambda$ C) $\dfrac{c}{\lambda}$ D) $\dfrac{h\lambda}{c}$

21) One of them which is not part of optical fiber is
A) Core   **B)** Cladding   **C)** Sheath   **D)**Resonator

22) In step index fiber, the refractive index of the core is
A) Constant   **B)** Random   **C)** Parabolic   **D)** None

23) The He-Ne laser is a
A) Two level laser   **B)**Three level laser   **C)** Four level laser   **D)** None

24) If the angle of incidence of a ray is equal to the critical angle at the interface of core and cladding then the rays travel

A) in the cladding   **B)** along the interface   **C)** in the core   **D)** none

25) The transmission of signal through the optical fiber is of the form of

A) sound   **B)** light   **C)** electricity   **D)** heat

26) Measurement of variation of divergence of laser beam with distance is used to determine

A) Coherence   **B)** Monochromaticity   **C)** Brightness   **D)** Directionality

27) Which of the following conditions is very essential for the production of laser light

A) Spontaneous emission   **B)**Stimulated emission   **C)** population inversion   **D)** all of above

28) Which of the following is not a pumping process ?

A) Optical pumping   **B)** Electrical pumping   **C)** Chemical pumping   **D)** Thermal pumping

29) Which of the following scheme does not produce lasing action ?

A) two level scheme   **B)** three level scheme   **C)** four level scheme   **D)** five level scheme

30) Which part is not included in the fibre optic communication system ?

A) transmitter   **B)** transformer   **C)** receiver   **D)** none

31) Optical fibers are basically

A) insulators   **B)** conductors   **C)** semiconductors   **D)** superconductors

32) The monochromatic light is

A) laser   **B)** sun light   **C)** mercury lamp   **D)** none

33) The excited state which has long life time is known as

A) excited state   **B)** ground state   **C)** metastable state   **D)** none

34) In stimulated emission process, the emitted photons will be

A) random in direction   **B)** in the direction of incident photon

C) in the opposite direction of incident photon   **D)** none

35) The process of raising the atoms from lower energy state to higher energy state is called

A) population inversion   **B)** pumping   **C)** stimulated emission   **D)** none

36) If A_{21} is the Einstein coefficient for spontaneous emission then the spontaneous emission life time is

A) A_{21} **B)** $\dfrac{1}{\sqrt{A_{21}}}$ **C)** $\dfrac{1}{A_{21}^{2}}$ **D)** $\dfrac{1}{A_{21}}$

37) If N_1 and N_2 be the number of atoms in the lower and higher energy states respectively, the condition for population inversion is

A) $N_1 \leq N_2$ **B)** $N_1 = N_2$ **C)** $N_2 \gg N_1$ **D)** $N_1 \geq N_2$

38) The graded index fibres are of

A) reflective type   **B)** diffractive type   **C)** refractive type   **D)** none

39) Angle of acceptance is maximum for a fibre if the critical angle is

A) maximum   **B)** minimum   **C)** zero   **D)** infinity

40) In graded index fibre, the refractive index is maximum at the

A) core-cladding interface   **B)** cladding   **C)** axis of the fibre   **D)** none

ANSWERS

1) D   2) D   3) C   4) C   5) C   6) D   7) A   8) C   9) C   10) D   11) C   12) B   13) C

14) A   15) A   16) A   17) A   18) B   19) D   20) A   21) D   22) A   23) C   24) B   25) B   26) D

27) D   28) D   29) A   30) B   31) A   32) A   33) C   34) B   35) B   36) D   37) C   38)C   39) B

40) C