M18001020

Registration No: | | | | | | | | | | |

Total Number of Pages : 03 **B.TECH**

B.TECH 2ND SEMESTER REGULAR EXAMINATIONS, MAY 2018
ENGINEERING PHYSICS
Subject Code:BBSBS1021
Time: 3 Hours
Max Marks : 100

CO1: Solve engineering problems using the concept of oscillation and wave mechanics

CO2: Apply the concept of light in LASER & optical fiber and in communication system.

CO3:To interpret the properties of elemental solids in terms of their structure

CO4: Execute gradient, divergence and curl effectively in engineering problems

CO5: Construct a quantum mechanical model to explain the behavior of a system at microscopic level and recognize the fundamental aspect of Nano science and its application

PART-A (10X1 = 10 MARKS)

Answer *All* Questions.

a. A damped oscillator is represented by : $Y(x,t) = e^{-0.25t}12\sin(7\pi t + 0.5x)$. What is its Q-factor? [CO1]

a. 35π b. 41π c.14π d. 53π

b. The resultant amplitude due to superposition of two equal waves is equal to the magnitude of the amplitude of either wave. What is the phase difference between the two waves? [CO1]

a. $\frac{2\pi}{3}$ b. $\frac{\pi}{3}$ c. π d. $\frac{\pi}{2}$

c. In case of Bi-prism experiment the interference occurs due to superposition of [CO1]

a. real sources b. virtual sources c. Both real & virtual d. None

d.The smallest volume unit cell in a crystal structure is called as: [CO3]

a.Primitive unit cell b. Prime cell c. Fundamental cell d. Simple cell

e. X-ray is used for crystal diffraction because x-ray has: [CO3]

a. larger wavelength b. no visible range c. smaller wavelength d. none of these

f. Which integral theorem converts a Line integral into a Surface integral. [CO4]

a. Green's theorem b. Gauss Divergence theorem c. Poynting theorem d. Stoke's theorem

g. The SI unit of Poynting vector is: [CO4]

a. Erg/meter^2 b. Joule/meter^2 c. Watt/meter^2 d. No unit

h. Activator atoms in a Ruby laser is: [CO2]

a. aluminium b. oxygen c. iron d. chromium

i. Light travelling in a step-index fibre follows a : [CO2]

a. Zigzag path b. Helical path c. Circular path d. Straight-line path

j. The Photo electric effect is : [CO5]

a. a slow process b. an instant process c. a strong process a. d.An adiabatic process

PART-B (15 x 2 = 30 MARKS)

Answer any fifteen questions from the following.

1. When a load of 3 Kg. given to spring , it stretches 0.5 cm. If the load is replaced by another 6 Kg. then what will be the new time period of the oscillator ? [CO1]
2. Mention the condition of critical damping and its applications? [CO1]
3. 12 number of similar waves superpose incoherently to produce resultant amplitude 108 unit. If they will superpose coherently, then find the resultant amplitude. [CO1]
4. In Bi prism experiment, the width of the slit is 3mm, distance between slit & screen is 120cm. wavelength is 5896 A^0, then find the fringe width. [CO1]
5. The Numerical Aperture of an optical fiber is 0.5 and the core index is 1.54. Find the refractive index of the cladding material and angle of acceptance ? [CO2]
6. Give the Energy Transition diagram of Ruby Laser? [CO2]
7. Differentiate between the grad-index and step-index fibres ? [CO2]
8. Calculate the ratio between the inter-planar spacing between (1 1 1) planes of two cubic crystals having lattice parameter $3A^0$ and $4A^0$ respectively? [CO3]
9. Find the Miller indices of a crystal plane having the intercepts 1**a**,2**b** and 3**c** with the crystallographic axes respectively? [CO3]
10. Differentiate between the Dia, Para, and Ferro magnetic materials ? [CO3]
11. Find the Flux of the vector $\vec{A}=2\hat{\imath}x^2y+3\hat{\jmath}y^2z+4\hat{k}z^2x$ along xy-palne, where x = 0 to 1, y = 0 to 1? [CO4]
12. Evaluate Divergence of the vector field, $\vec{V}=3\hat{\imath}xy+4\hat{\jmath}yz+5\hat{k}zx$, at (1,2,3). [CO4]
13. State Faraday's law of electromagnetism and obtain its differential form. [CO4]
14. Give the characteristics of electro-magnetic waves? [CO4]
15. Differentiate between the conduction current and displacement current?. [CO4]
16. A point source emits light with power 500 W. Find the average value of the Poynting vector at a distance of 2.5m from the source. [CO4]
17. Write Maxwell's time independent equations in differential form? [CO4]
18. State Heisenberg's uncertainty relation. [CO5]
19. The wave function ψ of a system is a linear combination of Eigen functions ψ_1, ψ_2, ψ_3, ψ_4, and ψ_5.. Find out the probability of 1st and 5th state of the given wave function? [CO5]

$$\psi=\frac{1}{\sqrt{3}}\psi_1+\frac{1}{\sqrt{3}}\psi_2+\frac{1}{\sqrt{6}}\psi_3+\frac{1}{\sqrt{24}}\psi_4+\frac{1}{\sqrt{8}}\psi_5$$

20. Write some techniques used for nano particle fabrication? [CO5]

PART-C (6 x 5 = 30 MARKS)

Section-i **Answer any Six questions**

1. Set up the differential equation of a damped harmonic motion and graphically represent the three types of damped oscillator with the conditions of occurrence? [CO1]
2. Derive the expression for the resultant amplitude due to superposition of two wave having equal frequency and wavelength but different amplitudes in a medium ? [CO1]
3. Discuss about the working of the zone plate? [CO1]
4. State and prove Bragg's law? [CO3]
5. Differentiate between grad index and step index optical fibres? [CO2]
6. Prove that , Curl Grad f = 0, where 'f' is a scalar field . [CO4]
7. In a photoelectric experiment, the threshold wavelength of tungsten cathode is $2500A^0$. If it is irradiated by a light of wavelength $2000A^0$, then find the maximum kinetic energy of the emitted electrons and velocity of the photoelectrons? [CO5]
8. Write two applications of (i) Superconductors (ii) Magnetic materials [CO5]

Section-ii **Answer any Two questions** **(2 x 15 = 30 MARKS)**

1. a. Discuss with a neat diagram that how interference fringes are produced in Newton's Ring Experiment and derive the expression for the diameters of the dark and bright rings? [CO1] [10]

   b. The diameter of the $(n+5)^{th}$ bright ring and (n+10)th bright ring are 0.5cm and 1cm respectively. If the wavelength of light and the radius of curvature of the plano-convex lens are $6000A^0$ and 100cm respectively, then find the diameter of (n+15)th bright ring? [CO1] [5]

2. a. Differentiate between TYPE-I and TYPE-II superconductor. Determine the critical current density for 1mm diameter wire of aluminum at 1.0K, where, T_c=1.196K, $H_0 = 7.9X10^3$ A/m. [CO3] [10]

   b. Give the methods to find the Miller Indices of a crystal plane with s uitable example ? [CO3] [5]

3. a. Write all Maxwell's equations in integral and differential form and state the fundamental laws from which they are derived? [CO4] [10]

   b. Evaluate Div Curl $\vec{A}$, where $\vec{A}$ is a vector field ? [CO4] [5]

4. a. Using Schrodinger's equation, discuss the case of a free particle in one dimensional potential well. Find its energy Eigen values of the excited states?. [CO5] [10]

   b. Normalize the wave function $\psi(x, t) = \sqrt{\frac{2}{\pi}}\cos x$ for a particle moving in one dimension between $x = -\frac{\pi}{2}$, and $x = \frac{\pi}{2}$. [CO5] [5]

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