CBCS SCHEME

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18PHY12/22

First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024
Engineering Physics

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define simple harmonic motion and mention its characteristics. Derive expression for effective spring constant for two springs in series and parallel. **(09 Marks)**

b. Distinguish between subsonic supersonic, Transonic and hypersonic waves. **(06 Marks)**

c. The distance between two pressure sensors in a shock tube is 100mm. The time take by the shock wave to travel this distance is 0.2ms. If the velocity of sound under the same condition is 330ms^{-1} find the mach number of shock waves. **(05 Marks)**

OR

2 a. What are damped and forced vibrations? Give examples write a note on sharpness of resonance. **(08 Marks)**

b. What are shock waves? Describe construction and working of Reddy's shock tube. **(08 Marks)**

c. A body having a mass 4gm executes simple harmonic motion. The force acting on the body, when the displacement is 8cm is 24gm.wt. Find the period if the maximum velocity is 5m/s, find the amplitude and maximum acceleration (g = 9.8 ms^{-2}). **(04 Marks)**

Module-2

3 a. State and explain Hook's law, and different elastic module. **(08 Marks)**

b. What is torsinal pendulum? Derive an expression for couple per unit twist of a solid cylinder **(08 Marks)**

c. Two solid cylinders of the save material having length ℓ, 2 ℓ and r, 2r respectively are joined coaxially, under a coupled applied between the free ends, the shorter cylinder shows a twist of 30°. Calculate the twist of the laser cylinder. **(04 Marks)**

OR

4 a. Define neural surface of a beam. Obtain an expression for bending moment of a rectangular beam. **(08 Marks)**

b. Derive the relation between Young's modulus, bulk modulus and Passions ratio. Discuss the limiting values of σ. **(08 Marks)**

c. A steel wire of 1mm radius is bent to form a circle of 10cm radius. What is the bending moment and the maximum stress, if Young's modulus = 2×10^{11}N-m^{-2} **(04 Marks)**

Module-3

5 a. Define gradient, divergence and Carl. Derive Gauss's divergence theorem. **(08 Marks)**

b. What is V-number? Explain three different types of optical fibre with neat diagram. **(08 Marks)**

c. An optical fibre of 600m long has input power of 120mW which emerges out with power of 90mW. Find attenuation in the fiber. **(04 Marks)**

OR

6 a. Define attenuation angle acceptance. Derive the condition for propagation of light through an optical fiber. **(08 Marks)**

b. List the four Maxwell's equations for time varying conditions. Explain the conditions for elliptical polarization of electromagnetic waves. **(08 Marks)**

c. Find the divergence of the vector field $\vec{A}$ given by $\vec{A} = 6x^2\hat{a}_x + 3xy^2\hat{a}_y + xyz^3\hat{a}_z$ at a point P(1, 3, 6). **(04 Marks)**

Module-4

7 a. State and explain Heisenberg's concentrating principle. Show that no electrons present inside the nucleus. **(09 Marks)**

b. Define population inversion. Explain construction and working of carbon dioxide laser with neat diagrams. **(07 Marks)**

c. An electron is bound is one dimensional potential well of width 0.12nm. Find the every values in the ground stets and first exacted states electron volt (eV). **(04 Marks)**

OR

8 a. Obtain an expression for energy density of radiation under equilibrium condition in terms of Einstein's coefficients. **(08 Marks)**

b. Mention the properties of wave function. Set up one dimensional time independent wave equation. **(08 Marks)**

c. Find the ratio of population of two energy levels in a laser if the transition between them produces light of wavelength 694.3nm. Assume the ambient temperature to be 27°C. **(04 Marks)**

Module-5

9 a. Explain success of quantum free electron theory and discuss the variation of Fermi factor with temperature. **(08 Marks)**

b. What is internal field? Derive Clausius – Morsotti equation. **(08 Marks)**

c. The resistivity of intrinsic Germanium at 25°C is equal to 0.47 ohm-meter. Assuming electron and hole mobilities as 0.38 and 0.18$m^2 v^{-1}s^{-1}$ respectively, calculate the intrinsic carrier density. **(04 Marks)**

OR

10 a. What is Hall effect? Explain an expression for electrical conductivity of a semiconductor. **(08 Marks)**

b. Explain density of states, polar and non-polar dielectrics **(08 Marks)**

c. The hall coefficient of a specimen is $-3.66 \times 10^{-4} m^3 c^{-1}$, its resistivity is 8.93×10^{-3}. Find mobility and density of charge carriers. **(04 Marks)**

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