21502

Roll No. _____ Total No of Pages: 4

21502
B. Tech. II Sem. (Main) / B. Tech. I Sem. (Back)
Exam., May - 2019
BSC
2FY2-02 / 1FY2-02 Engineering Physics

Time: 3 Hours **Maximum Marks: 160**

Instructions to Candidates:

Part – A: *Short answer questions (up to 25 words) 10 × 3 marks = 30 marks. All ten questions are compulsory.*

Part – B: *Analytical/Problem solving questions 5 × 10 marks = 50 marks. Candidates have to answer five questions out of seven.*

Part – C: *Descriptive/Analytical/Problem Solving questions 4 × 20 marks = 80 marks. Candidates have to answer four questions out of five.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART - A

Q.1 What is the role of compensating plate in Michelson's experiment? [3]

Q.2 Find the possible maximum numbers of orders observable with grating. [3]

Q.3 What is the De – Broglie's Hypothesis? [3]

Q.4 How will you explain orthogonal wave functions? [3]

Q.5 Light of wavelength 4800Å has a length of 25 waves. What is the coherent time? [3]

Q.6 What are essential requirements to produce a laser? [3]

Q.7 Explain the effect of temperature on Fermi – Dirac distribution function. [3]

Q.8 Distinguish between covalent and metallic bonds. [3]

Q.9 State Gauss's divergence and Stokes' theorem. [3]

Q.10 Explain the displacement current. [3]

PART – B

Q.1 What will be effect on Newton's rings if –

(a) The Plano convex lens is raised by height h from the surface of plane glass plate. [5]

(b) A Plano convex lens of small radius of curvature is used. [5]

Q.2 A set of 10 parallel equidistant slits of width 0.50 cm and opaque space 1.4 cm are used to study Fraunhofer diffraction of wavelength 0.60 cm falling normally on the planes of slits. Calculate –

(a) Angular positions and half width of first maxima. [5]

(b) The effect of covering up alternative slits on angular position and half width of first maxima. [5]

Q.3 The wave function of a certain particle is $\Psi = A\cos^2 x$ for $-\frac{\pi}{2} < x < \frac{\pi}{2}$ [5+5=10]

(a) Find the value of A

(b) Find the probability that the particle be found between $x = 0$ and $x = \frac{\pi}{4}$

Q.4 Calculate the coherence time and coherence length of white light of wavelength range from 3500Å to 6500Å. [5+5=10]

Q.5 In He – Ne laser, what is the function of the He atoms? Explain the answer with the help of energy level diagram for He – Ne laser. Describe with a neat sketch the working of He – Ne laser. [2+3+5=10]

Q.6 What is Hall Effect? Obtain the expression for Hall coefficient, Hall voltage and Hall mobility. [2+4+2+2=10]

Q.7 The electric field intensity of EM wave in free space is given by [10]

$$\vec{E} = E_0 \cos w\left(t - \frac{2}{v}\right) \hat{a}y$$

Determine the magnetic field intensity.

PART – C

Q.1 What is the plane transmission grating? Show that the intensity of light diffracted from a plane transmission grating is given by - [4+12+4=20]

$$I = I_0 \left(\frac{\sin\alpha}{\alpha}\right)^2 \left(\frac{\sin N\beta}{\sin\beta}\right)^2$$

Symbols carry their usual meanings. Find the possible maximum numbers of orders observable with a grating.

Q.2 Derive time independent Schrodinger equation for a free particle. Find the eigen values and eigen functions of a particle confined in one dimensional box of size a. [10+5+5=20]

Q.3 What do mean by Numerical aperture of an optical fibre? Find the expression for the Numerical aperture of a step index fibre. Discuss the use of optical fibre in : [4+8+4+4=20]

(a) Fibro scope

(b) Optical gyroscope

Q.4 Explain energy band theory of crystals. On its basis bring out the difference between insulators, semiconductors and metals. The electron and hole concentrations in a sample of semiconductor are $5\times10^{19}/m^3$ and $8\times10^{20}/m^3$ respectively. If the mobility of electron and hole are 0.09 $m^2v^{-1}s^{-1}$ and 0.05 $m^2v^{-1}s^{-1}$ respectively, then calculate the hall coefficient of the semiconductor. [6+8+6=20]

Q.5 Derive all four Maxwell's equations for electromagnetics. Write a short note on propagation of electromagnetic wave in free space. [12+8=20]
