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Roll No. _____

21502/11502

B. Tech. I / II Sem. (Main/Back) Exam., Dec. - 2019

BSC

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 suitable be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

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

1. NIL 2. NIL

PART - A

Q.1 What happen in case of Newton's ring, if plano convex lens is replaced by plano concave lens? [3]

Q.2 State Rayleigh's criterion of resolution. [3]

Q.3 Write physical significance of wave function. [3]

Q.4 Write two difference between Temporal coherence and Spatial coherence. [3]

Q.5 Calculate the refractive index of cladding material from following data: [3]

NA = 0.22 and $\Delta = 0.012$

Q.6 Write the properties of Laser. [3]

Q.7 The intrinsic carrier density is $1.5\times10^{6}/m^{3}$. If the electron and hole mobilities are 0.13 and 0.05 m^2/Vs, respectively. Calculate its electrical conductivity. [3]

Q.8 Two wave train overlaps 40% of their length. If the maxima in the resulting interference pattern receives 20 units of light, how much do the minima receives? [3]

Q.9 Explain physical significance of divergence. [3]

Q.10 What do you mean by term displacement current? [3]

PART – B

Q.1 Newton's rings are observed in reflected light 5.9×10^{-5}cm. The diameter of 10^{th} dark ring is 0.5cm. Find the radius of curvature of lens and the thickness of the air film. [10]

Q.2 The width of a slit is 0.012mm. Monochromatic light is incident on it. The angular position of first bright line is 5.2°. Calculate the wavelength of incident light. [10]

Q.3 Prove that Eigen function of a particle moving in one-dimensional box are orthogonal. [10]

Q.4 Explain with diagram the propagation of light inside an optical fiber. [10]

Q.5 How can probability of stimulated emission be increased? [10]

Q.6 What is Fermi Dirac distribution function? Explain effect of temperature on Fermi function. [10]

Q.7 Derive Laplace's equation. [10]

[3810]

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PART – C

Q.1 With schematic diagram, explain the working of Michelson Interferometer. How shall you use it to measure wavelength separation between two closely spaced sodium D_1 and D_2 lines? [12+8=20]

Q.2 Solve Schrodinger's equation for a particle trapped in three-dimensional cubical box of side 'a'. Explain the term 'Degeneracy'. [12+8=20]

Q.3 (a) With the help of neat energy level diagram, explain the working of He-Ne laser. [12]

(b) Write application of laser in Science and Medicine. [8]

Q.4 (a) Explain Hall Effect. Obtain the expression for Hall coefficient. Write a short note on the applications of Hall Effect. [4+4+4=12]

(b) An electric field of 100 V/m is applied to a sample of n-type semiconductor whose Hall coefficient is –0.0125 m^3/c. Determine the current density in the sample assuming $\mu_s = 0.36\ m^2v^{-1}s^{-1}$. [8]

Q.5 (a) Derive Maxwell's equation in free space in integral form. [12]

(b) Explain the physical significance of various terms involved in the expression of Poynting vector. [8]