RTU paper

1E2402

Roll No. _ Total No of Pages: 3

1E2402
B. Tech. II - Sem. (Main) Exam., May - 2019
BSC
2FY2 – 02 Engineering Physics
(Common for all branches)

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

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

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

(Answer should be given up to 25 words only) **[10×3=30]**

All questions are compulsory

Q.1 Write two differences between Haidinger fringes and Fizeau fringes.

Q.2 Explain the role of compensating glass plate in Michelson's Interferometer.

Q.3 Enumerate the difference between Fresnel and Fraunhofer class of diffraction.

Q.4 Why a semiconductor behaves like an insulator at 0K temperature?

Q.5 Explain the meaning of zero point energy.

Q.6 Write any two advantages and applications of an optical fibre.

Q.7 What do you understand by term pumping in LASER system?

Q.8 What is Hall Effect? Write expression for Hall coefficient.

Q.9 Define Fermi distribution function & show the dependence of it on temperature.

Q.10 Define divergence & its physical significance.

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PART – B

(Analytical/Problem solving questions) **[5×10=50]**

Attempt any five questions

Q.1 Write a short note on resolving power. What do you understand by geometrical & spectral resolving power?

Q.2 Light containing two wavelengths λ_1 and λ_2 falls normally on a Planoconvex lens of radius of curvature R resting on a glass plate. If the n^{th} dark ring due to λ_1 coincides with $(n+1)^{th}$ dark ring due to λ_2, then prove that the radius of n^{th} dark ring of λ_1 is given by,

$$r_n = \left(\frac{\lambda_1\lambda_2 R}{\lambda_1 - \lambda_2}\right)^{1/2}$$

Q.3 Calculate first two energy levels of an electron confined in a rigid potential box of width 1Å.

Q.4 Write the expression for visibility and show that visibility is a measure of coherence.

Q.5 Explain the term "Bonding in Solids". What do you mean by metallic bonding?

Q.6 What is the difference between spontaneous and stimulated emission? Why is spontaneous radiation incoherent?

Q.7 Write short note on:-

(i) Displacement current

(ii) Poynting vector

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PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[4×20=80]**

Attempt any four questions

Q.1 Derive the following expressions for plane transmission grating

(i) $I = I_0 (\sin\alpha/\alpha)^2 . (\sin N\beta/\sin\beta)^2$

(ii) Angular width of n^{th} principal maxima, $2d\theta n = 2 \tan\theta / nN$

Q.2 Derive the Schrödinger's time dependent & independent wave equations. Write down the equation for a free particle confined in a one dimensional box of size 'a'. Obtain Eigen values and normalized wave function for this particle.

Q.3 Explain the term absorption, spontaneous and stimulated emission. Also derive the relation between Einstein's coefficients for laser action and discuss the results. Describe the construction and working of He – Ne laser with neat labelled diagram.

Q.4 Classify the solid as conductor, semiconductor and insulator according to band structure. Derive an expression for electrical conductivity in intrinsic semiconductors. How is the electrical conductivity modified in extrinsic semiconductors?

Q.5 What are Maxwell's equations? Derive Maxwell's equation in an isotropic medium and in free space.

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