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**First/Second Semester B.E. Degree(CBCS)Examination**

**Engineering Physics**

Time: 3 hrs.

Max. Marks: 80

**Note: 1. Answer any FIVE full questions, choosing one full question from each module.**

**2. Physical Constants: Velocity of light,  $c = 3 \times 10^8 \text{ m/s}$ , Planck's constant,  $h = 6.625 \times 10^{-34} \text{ JS}$ ; Mass of electron  $m = 9.1 \times 10^{-31} \text{ kg}$ ; Boltzmann constant,  $k = 1.38 \times 10^{-23} \text{ J/K}$ ; Avagadro number,  $N_A = 6.02 \times 10^{26} / \text{K mole}$**

**Module-1**

1. a. State Planck's law of black body radiation. Show that Planck's law reduces to Wien's law and Rayleigh Jeans law at lower and higher wavelength limits respectively. (07 Marks)
- b. Based on Heisenberg's uncertainty principle, show that electrons cannot exist within the nucleus. (05 Marks)
- c. Calculate the de Broglie wavelength of an electron moving with a K.E. of 50 Kev. (04 Marks)

**OR**

2. a. What is phase velocity and group velocity? Show that group velocity is equal to particle velocity. (05 Marks)
- b. Obtain the solution of Schrodinger's time independent wave equation for a particle in a one dimensional potential box of infinite height. (07 Marks)
- c. X-rays of wavelength  $0.75 \text{ \AA}$  are scattered from a target at an angle of  $45^\circ$ . Calculate the wavelength of scattered X-rays. (04 Marks)

**Module-2**

3. a. What is Fermi level? Describe the variation of Fermi factor with temperature. (05 Marks)
- b. What is Meissner effect? Write a note on Type – I and Type – II super conductors. (07 Marks)
- c. For intrinsic gallium arsenide, the room temperature electrical conductivity is  $10^{-6} \text{ ohm}^{-1} \text{ m}^{-1}$ . The electron and hole mobilities are respectively  $0.85 \text{ m}^2/\text{Vs}$  and  $0.04 \text{ m}^2/\text{Vs}$ . Calculate the intrinsic carrier concentration at room Temperature. (04 Marks)

**OR**

4. a. Explain the BCS theory of super conductivity. (05 Marks)
- b. State law of mass action. Obtain an expression for the intrinsic carrier density. (07 Marks)
- c. Calculate the probability of finding an electron at an energy level  $0.02 \text{ eV}$  above Fermi level at  $300\text{K}$ . (04 Marks)

**Module-3**

5. a. Explain the construction and working of carbon dioxide Laser. (08 Marks)
- b. Obtain an expression for the numerical aperture of an optical fiber. (04 Marks)
- c. The average power output of a laser beam of wavelength  $6500 \text{ \AA}$  is  $10 \text{ mw}$ . Find the number of photons emitted per second by the laser source. (04 Marks)

**OR**

6. a. What is holography? Explain the principle and method of recording an image on a hologram. (06 Marks)
- b. Explain the different types of optical fibers. (06 Marks)
- c. An Optical signal propagating in a fiber retains  $85\%$  of input power after travelling a distance of  $500 \text{ m}$  in the fiber. Calculate the attenuation coefficient. (04 Marks)

# Question Paper Of Engineering Sciences

**Dr. Steve Coxon ,Dr. Rebecca  
Dohrman,Gretchen Roberts**



## **Question Paper Of Engineering Sciences:**

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