

2E1003	Roll No. _____	[Total No. of Pages : 4]
	2E1003	
	B. Tech. I Year II Semester (Old Back) Examination, June/July-2011 Physics	

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 24

Instructions to Candidates:

*Attempt overall **five** questions selecting **one** question from **each** unit. All questions carry **equal** marks.*

Unit - I

1. a) i) Describe the construction and working of Michelson inter Ferometer. How would you use it to measure the wavelength of monochromatic light? (8)
- ii) Show that the plane polarised and circularly polarised light are special case of elliptically polarised light. (6)
- iii) The refractive indices of some transparent material for right handed and left handed circularly polarised light of sodium (wavelength 5893 Å) are 1.54427 & 1.54420 respectively. Calculate the specific rotation of that material. (2)

OR

- b) i) Show that the linearly polarised light can be represented as a superposition of two circularly polarised lights of suitable amplitude and phases. (8)
- ii) Explain the formation of Newton's rings in reflected light. Prove that the diameters of the dark rings are proportional to the square root of the natural numbers. (6)
- iii) A single layer of coating of thickness $\frac{\lambda}{4}$ is deposited on a convex lens of $\mu_g = 1.9$ to reduce its reflectivity minimum. What is the refractive index of coating? (2)

Unit - II

2. a) i) With necessary theory explain the formation of spectrum by a plane transmission grating when composite light falls on it normally. (7)
- ii) Explain Rayleigh's criterion of resolution. (5)
- iii) Describe the method of recording the hologram and reconstruction of image from it. (4)

OR

- b) i) Derive an expression for the intensity of diffracted light in the Fraunhofer's diffraction due to a single slit. (7)
- ii) Give briefly the requirements for holography and mention various properties of a hologram. (5)
- iii) Derive an expression for the resolving power of a grating. (4)

Unit - III

3. a) i) Compare coherence in the case of an ordinary source and a LASER. (4)
- ii) Explain the terms absorption, spontaneous emission and stimulated emission. (4)
- iii) Write notes on following :-
- a) optical fibre (2)
- b) High intensity of LASER (2)
- c) High directionality of LASER (2)
- d) Q-switching. (2)

OR

- b) i) Derive the relation between Einstein's coefficient and discuss the result. (4)
- ii) Describe the laser action in He-Na laser with energy diagram. (4)
- iii) a) What is mode locking? (2)
- b) Discuss the application of laser in scientific investigations. (2)

- c) What is semiconductor laser? (2)
- d) In a typical optical fibre the refractive indices of the core and cladding materials are 1.55 and 1.53 respectively. Calculate the numerical aperture of the optical fibre. (2)

Unit - IV

4. a) i) Explain the term threshold frequency and stopping potential. How does the emission of photo electron depend on the intensity and the frequency of incident light? (4)
- ii) What is compton scattering? Obtain an expression for shift in wavelength of the scattered photon by compton scattering. (6)
- iii) a) Mention the differences between photo electric effect and compton effect. (2)
- b) Discuss the physical interpretation of wave function and its properties. (2)
- c) Find the lowest energy of an electron confined to move in one dimensional potential box of length 1\AA . (2)

OR

- b) i) Describe Heisenberg's uncertainty principle and apply it to explain non-existence of electron in nucleus. (3)
- ii) What is potential barrier? Calculate the reflection and transmission coefficients of rectangular potential barrier for $E > V_0$. Also prove that the transmission coefficient will be one for certain values of energy. (7)
- iii) a) Defining fermi energy, explain the Fermi-Dirac distribution law. (2)
- b) Write a note on Sommer field theory of free electrons. (2)
- c) Calculate the number of energy states available for the electrons in a cubical box of side 1cm below Fermi energy 3 eV. (2)

Unit - V

5. a) i) State the postulates of special theory of relativity and deduce Lorentz transformations. (7)
- ii) Show that relativistic invariance of conservation of momentum leads to variation of mass with velocity. (7)

- iii) If 1 gram of matter could be converted entirely into energy, what would be the cost of energy so produced at Rs. 2 per KWh? (2)

OR

- b) i) Describe the principle of radiation detector based on the production of ionization. Hence explain the difference between them. (7)
- ii) Explain the terms plateau, avalanche, quenching and dead time in Geiger-Muller counter. How quenching is achieved in it? (7)
- iii) In a GM counter on an average 10^{10} electrons/count are collected. If count rate is 10 per second, then find the ionisation current. (2)