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B. Tech. Ist Semester (Main) Examination Feb.-2010**Physics - I****(Common to all Branches of Engineering)****1E1023****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) Explain with the help of diagram and experiment arrangement to produce Newton's rings. (2+4)
- b) What are the differences between fringes obtained in Newton's ring experiment and those produced by a bi-prism. (4)
- c) In Newton's ring experiment an air film is formed between two convex surfaces each of radius of curvature 1m. Newton's rings are generated by using a light of wavelength 5000 \AA . Find the distance between 16th and 9th dark rings. (6)

OR

- a) Explain the working of Michelson's interferometer. How circular fringes be produced with it. (3+3)
- b) Show how Michelson's interferometer is used to find the wavelength of light. (4)
- c) Write short note on
 - i) Antireflection coating and
 - ii) Interference filters. (3+3)

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Unit - II

2. a) What do you understand by the term 'polarization of light'. Distinguish between polarized and unpolarized light in details. (3+5)
- b) What is meant by plane polarized, circularly polarized and elliptically polarized light. State Malus Law. (6+2)

OR

- a) Discuss double reflection in calcite crystal. How can a phase retardation plate be obtained from it. (4+4)
- b) Describe a polarimeter and explain how it is used to measure the strength of sugar solution. (3+5)

Unit - III

3. a) Find out an expression for intensity at a point in a Fraunhofer diffraction due to single slit. Draw the intensity distribution curve. (6+2)
- b) 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. (8)

OR

- a) Deduce suitable formula to show the resolving power of a plane transmission grating depends on
- i) Number of ruled lines and
 - ii) Width of ruled space (8)
- b) A sodium light consists of two lines of wavelength 5890 \AA and 5896 \AA . Find the minimum number of lines that a grating must have in order to resolve their wavelength in first order. (8)

Unit - IV

4. a) i) What is the difference between Compton effect and photoelectric effect. (2)
- ii) Explain how Compton scattering confirms the quantum nature of radiation. (2)
- iii) Give reasons why the Compton shift is detectable only in X-rays region and not in visible range of light. (2)

- b) Calculate the percentage of the maximum shift in the wavelength of incident photons of wavelength 1 \AA and 10 \AA due to Compton scattering. What conclusion do you draw from this calculation. (8+2)

OR

- a) Derive Schrödinger's time dependent wave equation. What is the physical significance of wave function used in this equation. (6+2)
- b) Determine the expectation value of position of a particle in one dimensional box. (8)

Unit - V

5. a) State the postulates of special theory of relativity and deduce from them the Lorentz transformations. (2+6)
- b) Show that quantity $(x^2 + y^2 + z^2 - c^2 t^2)$ is invariant under Lorentz transformation. (8)

OR

- a) Show that the relativistic kinetic energy is given by $(m - m_0)c^2$ and it approaches to non-relativistic kinetic energy for $v \ll c$. (All symbols have their usual meanings). (8)
- b) Calculate the velocity of a particle at which its mass becomes twice of its rest mass. (8)