Thapar Institute of Engineering and Technology, Patiala
End Semester Examination, December 2006
PH101: Physics

Time : 3 hour **Marks : 36**

- *Paginate your Answer Book* **starting with the front sheet and write answers on the pages assigned to each question.**
- *Attempt all the questions* **and be brief and precise.**
- *Write your group number at the* ***top right corner*** *of your Answer Book*

Q1 Whether the following statement is True or False? No marks without the appropriate support of reasoning/mathematics.

(a) The necessity of a sufficiently thick fibre cladding was felt to ensure total internal reflection.
(b) The necessity of a polarizing field in the Magnetostriction method for the production of ultrasonics is to ensure that the frequency of the applied electrical field be equal to the natural frequency of the rod.
(c) Two diffraction gratings of different widths but of same grating element have different resolving powers.
(d) Any velocity added to/subtracted from the velocity of light gives the velocity of light.

(2X4)
pp 1-3

Q2

(a) Find the maximum number of orders available with a grating and show that only first order is possible if the width of grating element is less than twice the wavelength of light. Also derive the equation you use.

(b) In Newton's ring experiment, the diameters of the 4^{th} and 12^{th} dark rings are 0.4 cm and 0.7cm respectively. Find the diameter of the 20^{th} dark ring.

(c) Discuss how can we minimize the reverberation time.

(3, 2, 2)
pp 4-6

Q3

(a) Discuss the spatial coherence and the temporal coherence in laser light. Also discuss the properties they are responsible for.

(b) A 5 mW laser beam passes through a 26 km fiber having loss, 0.2 dB/km. Calculate the power at the output end.

(c) For an optical fibre of given core index, show that the numerical aperture(NA) is proportional to the square root of the relative refractive index difference.

(3, 2, 2)
pp 7-9

Q4

(a) What are the postulates of special theory of relativity. Explain that a moving clock ticks more slowly than a clock at rest.

(c) A particle moves with a speed of 0.8c at an angle of 30^0 to the x-axis, as determined by O. What is the velocity of the particle as determined by a second observer O′, moving with a speed of -0.6c along the common x-x′?

(c) Write the underlying assumptions of Lorentz transformations.

(3, 2, 2)
pp 10-12

Q5

(a) Show that the relativistic invariance of the law of conservation of momentum leads to the concept of the equivalence of mass and energy.

(b) The capacitor of an LCR circuit is enclosed in a container. When the container is evacuated, the frequency of the circuit is 100 KHz. When it is filled with carbon dioxide the frequency decreases by 50 Hz. Calculate the dielectric constant of the gas.

(c) What is the significance of the displacement current?

(3, 2, 2)
pp 13-15