Roll No. 0244

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B.TECH(Group A&B)

FIRST SEMESTER

SEPTEMBER-2013

MID SEMESTER EXAMINATION

AP-103 APPLIED PHYSICS – I

Time: 1 Hour 30 Minute

Max. Marks: 20

Note: Answer ALL questions.
Assume suitable missing data, if any

1(a) Show that if V_0 is the rest volume of a cube of side l_0, then

$$V_0(1-\beta^2)^{1/2}$$

is the volume viewed from a reference frame moving with uniform velocity v in a direction parallel to an edge of the cube. 03

(b) Show by direct application of Lorentz transformation that $x^2+y^2+z^2-c^2t^2$ is invariant. 02

2(a) Let us consider two twins A and B, each 20 years of age. Twin A remains at rest at the origin (say at O) and twin B takes a round trip space voyage to a star with velocity v = 0.99c relative to A. The star is 10 light years away from O. Determine the age of A and B as B finishes his journey. 03

(b)) Show that the relativistic form of Newton's second law, when F is parallel to v, is $F = m_o \frac{dv}{dt}(1-\frac{v^2}{c^2})^{-3/2}$ 02

3(a) Calculate the resultant line-width, band width and coherence length assuming that we chop a continuous perfectly monochromatic beam of wavelength 6328 Å in 10^{-10} seconds using sort of shutter. 03

(b) A parallel beam of light strikes an oil film (μ= 1.4), floating on a surface of water (μ = 1.33). When viewed at an angle of 30° from the normal 6th dark fringe is seen. Find the thickness of the film. (Given wavelength of light = 589 nm). 02

4(a) Two plano-convex lenses, each of radius of curvature 100 cm, are placed with their curved surfaces in contact with each other. Newton's rings are formed by using a light of wavelength 6×10^{-5} cm. Find the distance between 10^{th} and 20^{th} rings. 03

(b) When the movable mirror in Michelson Interferometer or movable plate in Fabry Perot Interferometer move through one position of maximum visibility to the next such position the distance covered is 0.02894 cm for circular fringes with sodium light of mean wavelength 5893×10^{-8} cm. What conclusion is drawn about the nature of the sources of light? Also find the difference between the wavelengths of the close doublet. 02