This' question paper contains 4 printed pages.]'

iuod2i

8447   **A**

B.Tech. (M)/I

(Part Time)

PAPER EME – 102-PHYSICS I

Time : 3 *Hours*   *Maximum Marks* : 70

(Write your Roll No. on the top immediately

on receipt of this question paper.)

Attempt any five questions.

All questions carry equal marks

Assume missing data suitable, if any.

1. (a) Show that the simultaneous events in one frame are not in general
    simultaneous in another frame moving with uniform relative
    velocity with respect to first frame.   4

    (b) What do you mean by 'length contraction' ? Obtain the relation
    between proper length and improper length.   6

    (c) A stationary body explodes into two fragments each of rest
    mass 1.0 kg that move apart at speeds of 0.6c relative to the
    original body. Find the rest mass of the original body.   4

[P.T.O.

8447   (2)

2. (a) What are the characteristics of simple harmonic motion? Show that the total energy in S.H.M. remains constant throughout and is Independent of both displacement and time.   7

(b) Differentiate conductors, semiconductors and insulators on the basis of band theory of solids. How does the sensitivities of conductors and semiconductors vary with temperature ?   7

3. (a) What are X–rays ? How can they be produced ? Explain the origin of continuous and characteristic X–rays. Draw the relative intensities of X–rays with respect to wavelength for Molybdenum and Tungstun at 35 kv and explain why does Tungstun not exhibit characteristic peak at 35 kv.   7

(b) What is photoelectric effect? Write Einstein relation for photoelectric effect and explain how the laws of photoelectric effect can be explained using this relation.   7

4. (a) What is LASER ? Mention any four properties which distinguish laser from normal light.   3

(b) Explain the terms : (i) spontaneous emission, (ii) stimulated emission, (iii) metastable states, (iv) population invasion.   4

(c) Giving energy level diagrams explain the working principle of He-Ne laser. Mention four important engineering applications of lasers.   7

5. (a) Discuss the formation of Newton's rings in reflected monochromatic light and show that the diameters of dark lings are proportional to the square root of the natural numbers. 7

    (b) Define resolving power. What is Rayleigh's criterion for just resolution. Obtain the expression for resolving power of a grating. On what factors does it depend ?   7

6. (a) What is Nicol prism? Explain its principle, construction and working. Discuss its role as a polarizer and an analyzer. 7

    (b) Calculate the thickness of a doubly refracting crystal required to introduce a path difference of $\dfrac{\lambda}{2}$ between the O– and E– rays, when $\lambda = 6000$Å, $\mu_0 = 1.55$ and $\mu_E = 1.54$.   3

    (c) What is the minimum number of lines per cm in a 2.5 cm wide grating which will just resolve the two sodium lines (5890Å and 5896Å) in the second order spectrum?   4

7. (a) Define binding energy of a nucleus. Draw the binding energy per nucleon versus mass number curve. What conclusions can be drawn by this curve?   7

    (b) Calculate the amount of energy (in joules) released in the fission of 1 kg of U^{235} and in the fusion of 1 kg H^1. Assume that 200 MeV energy is released in the fission of one nucleus of U^{235} and 26.2 MeV energy is released in one proton-proton cycle. 7

[P.T.O.

8. Write short notes on any *four* of the followings : $(3\frac{1}{2} \times 4)$

   (i) Einstein's mass energy equivalence.

   (ii) de Broglie matter waves.

   (iii) Nuclear reactors.

   (iv) Piezoelectric effect.

   (v) Engineering uses of ultrasonics.

   (vi) Double refraction.