This question paper contains 4 printed pages.]

Your Roll No. ....

8472   **A**

B.Tech./I

Paper EEE/EEC–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 suitably, if any.

1. (a) Define : (i) Central force and (ii) Conservative force. Show that a central force is conservative force.   5

   (b) State the law of conservation momentum. Show that the angular momentum of a particle moving under the influence of a central force remains conserved.   5

   (c) At any instant of time, position of a particle is given by $\vec{r} = A \cos\theta \, \hat{i} + A \sin\theta \, \hat{j}$. Show that the force acting on the particle is a conservative force.   4

[P.T.O.

2. (a) What are ultrasonic waves ? Explain how piezoelectric effect can be utilized for the production of ultrasonic waves. Mention three important engineering applications of ultrasonic waves. 6

(b) Explain how Newton's rings experiment can be used to find refractive index of a liquid. 4

(c) A non-reflecting coating for the incident light of wavelength 5500Å is to be deposited. If the refractive index of the coating material is 1.35, what should be the minimum thickness of the coating. 4

3. (a) What do you mean by 'diffraction of light' ? Differentiate between Fresnel and Fraunhoffer diffractions. 4

(b) Define dispersive power and chromatic resolving power of a diffraction grating. Write the respective expressions and discuss the factors which effect them. $3 + 3 = 6$

(c) What is the highest order spectrum which may be seen with monochromatic light of wavelength 5000Å using a diffraction grating with 10,000 lines per cm. 4

4. (a) How polarized light differ from unpolarized light ? Define angle of polarization and explain its significance. 3

(b) Define (i) double refraction and (ii) optic axis. Explain how Nicol prism can be used for the production of plane polarized light. 4

(c) What is optical rotation ? Explain giving example of any two optically active substances. 3

(d) What is a quarter wave plate ? Calculate its thickness made up of calcite crystal with refractive indices 1.652 and 1.488 for the light of wavelength 5500Å. 4

5. (a) What is nuclear fusion. Explain giving example. Why it is also known as thermonuclear reaction? 4

(b) Discuss the harmful effects of nuclear radiation on human organism. 4

(c) Define nuclear binding energy. Calculate the binding energy and average binding energy per nucleon of the nucleus $^{35}_{17}Cl$. Given : mass of $^{35}_{17}Cl$ atom = 34.969 u, mass of a neutron mn = 1.0087 u and mass of hydrogen ^1_1H atom m_H = 1.0078 u. 2+6

6. (a) Differentiate between spontaneous and stimulated emissions and explain how stimulated emissions lead to lossing action. 5

(b) Write Einstein's photoelectric equation and state and explain the laws of photoelectric emission on the basis of this equation. 5

(c) What do you mean by 'de-Broglie matter waves' ? Why the magnification and resolution of electron microscopes is very high ? Explain. 4

[P.T.O.

7. (a) Discuss X-ray diffraction and obtain Bragg's law. Explain this can be used for the determination of crystal structure. 5

(b) Define 'acoustic impedance' of a medium and show that it depends on the elasticity and inertia of the medium. 4

(c) Discuss the motion of a simple pendulum and show that it is simple harmonic. Obtain an expression for the frequency of oscillation. 5

8. (a) State and explain Einstein's special theory of relativity. Discuss how the result of Michelson-Morley experiment was helpful in the formulation of Einstein's postulates. 4

(b) What do you mean by 'Length Contraction' ? Obtain an expression for it and show the reciprocity of the length contraction. 6

(c) A man weighs 60 kg. on the earth. When he is in a rocket ship in flight, his mass is 61 kg as measured by an observer on the earth. What is the speed of the rocket ? 4