This question paper contains 4 printed pages.]

Your Roll No. ..................

8497

B.Tech. (C)/I
(Part Time) (Civil Engg.)

Paper (ECE–102) PHYSICS

Time : 3 Hours Maximum Marks : 70

(Write your Roll No. on the top immediately
on receipt of this question paper.)

Answer any five questions.

Assume missing data, if any, suitably.

1. (a) Define central forces. Show that central forces are conservative
forces. Also show that motion under central forces must be in a
plane.

(b) Name the fundamental forces. Compare these fundamental forces
on the basis of field quanta, relative strength, range and the
particles having the Interaction.

2. (a) What is piezoelectric effect? How is it used for the production
of ultrasonics? Give important applications of ultrasonics.

[P.T.O.]
(b) What do you mean by 'Simple harmonic motion'? Show that the motion of a simple pendulum is simple harmonic and obtain the expression for time period and frequency.

(c) A particle is moving in SHM of amplitude 0.06 m and time period 3.14 seconds. Determine its velocity and acceleration amplitudes.

3. (a) What is entropy? Write the mathematical expressions of second law of thermodynamics.

(b) Calculate the increase in entropy when 1 gram of ice at -10 °C is converted into steam at 100 °C. Specific heat of ice is 0.5, latent heat of ice is 80 cal/g and latent heat of steam is 540 cal/g.

(c) Discuss Ingen-Hausz experiment to compare the thermal conductivity of different materials.

4. (a) Define 'interference' and mention the conditions required for the production of sustained interference patterns.

(b) Obtain the conditions for brightness and darkness in Newton’s rings experiment for the reflected light. Mention any two applications of Newton’s rings experiment.

(c) What is the highest order spectrum which may be seen with monochromatic light of wavelength 5000Å by means of a diffraction grating with 5000 lines/cm?
5. (a) Differentiate between Fresnel and Fraunhofer diffraction.

(b) Give the construction and theory of a plane transmission grating and explain the formation of spectra by it.

(c) Calculate the thickness of a doubly refracting plate capable of producing a path difference of \( \frac{\lambda}{4} \) between extraordinary and ordinary waves. Given

\[ \lambda = 5890\text{Å}, \mu_0 = 1.53, \mu_e = 1.54. \]

6. (a) What are X-rays? Explain the origin of continuous and characteristic X-rays. Derive the expression for energy of Ka X-ray spectral line.

(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. (a) What is LASER? Explain the principle and working of a ruby laser with clearly drawing the energy level diagrams.

(b) Sketch carefully the binding energy per nucleon versus mass number curve for stable nuclei. Explain its salient features. On the basis of this curve explain why fusion is possible only for low mass number whereas fission takes place in heavy nuclei.
8. Write short notes on any **four** of the following:

(i) Architectural acoustics.

(ii) Magnetostriction effect.

(iii) Double refraction.

(iv) de Broglie matter waves.

(v) Miller indices.

(vi) Dislocations in crystals.