



UNIVERSITY OF THE PUNJAB

B.A. / B.Sc. Part – I
Annual Examination - 2017

Roll No.

Subject: Physics-I
PAPER: A (Physics-I)

TIME ALLOWED: 3 hrs.
MAX. MARKS: 75

NOTE: Attempt FIVE questions, selecting not more than TWO questions from each section.

Section – I

- Q1. (a) Define Gradient of a scalar field and show that $\text{Grad}S = \nabla S$ (7)
(b) If Φ is a scalar function, prove that $\text{Curl}(\text{Grad} \Phi) = 0$ (5)
(c) What do you mean by Direction Cosines of a vector? (3)
- Q2. (a) Give a description of Conical Pendulum. Drive expression for its time period of revolution and mention its uses (8)
(b) A conical pendulum is formed by attaching a 53 g pebble to a 1.4 m string. The pebble swings in a circle of radius 25 cm.
(i) What is the speed and acceleration of pebble? (3)
(ii) What is tension in the string? (4)
- Q3. (a) Define conservative field. Show that in a conservative field, work done along a closed path is equal to zero. (8)
(b) A swinging pendulum eventually comes to rest. Is this a violation of law of conservation of energy? (3)
(c) A ball of mass 52.4 g is thrown from the ground into the air with an initial velocity of 16.3 m/s at an angle of 27.4° with the horizontal. What are the values of its kinetic energy initially and just before it strikes the ground? (4)
- Q4. (a) Discuss the consequences of Lorentz Transformation for
(i) the relativity of length and (10)
(ii) the relativity of time
(b) Comment on the following statement, "the relation $E=mc^2$ is essential to the operation of power plant based on nuclear fission". (2)
(c) An electron has a speed of 0.990 c (where c is velocity of light). What is the K.E of electron? (3)

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Section –II

- Q5. (a) What do you mean by torsional oscillator? Show that its motion is simple harmonic motion. Drive an expression for its time period. (8)
- (b) An oscillating block – spring system has a mechanical energy of 1.18 J, amplitude of 9.84 cm and maximum speed of 1.22 m/s. Find (i) spring constant of spring
(ii) Mass of block (iii) frequency of oscillation (5)
- (c) Give graphical representation of simple harmonic motion. (2)
- Q6. (a) Give a detailed description of Young's Double Slit Experiment. Find an expression for fringe spacing for bright and dark fringes. (8)
- (b) Why central spot of Newton's rings appears dark? (3)
- (c) A double slit experiment is performed with a light of wavelength 512 nm. The slits are 1.4 mm apart and screen is 3.4 meter from the double slits. Find the fringe width of the bright fringes as observed on the screen. (4)
- Q7. (a) What is diffraction of light? Clearly differentiate between Fresnel and Fraunhofer type of diffraction. (4)
- (b) Drive the conditions for maxima and minima of diffraction due to double slit. (8)
- (c) A slit of width d is illuminated by visible light. Calculate the value of d for which the first order minima of red light of wavelength 650 nm fall at $\theta = 15^\circ$ (3)

Section – III

- Q8. (a) Give two statements of second law of thermodynamics. (5)
- (b) Drive an expression for the efficiency of a Carnot's reversible heat engine. (8)
- (c) What are thermodynamic functions? Give examples. (2)
- Q9. (a) What do you mean by isothermal and adiabatic processes? (6)
- (b) State and explain clausius theorem and drive the definition of entropy. (7)
- (c) Explain the principle of increase of entropy. (2)
- Q10. (a) Deduce an expression for viscosity of a gas in terms of mean free path on the basis of kinetic molecular theory of gases. Show that viscosity is independent of pressure but depends upon temperature of gas. (10)
- (b) What do you mean by mean free path of gas. Drive an expression for it. (5)