



UNIVERSITY OF THE PUNJAB

B.A. / B.Sc. Part - I
Annual Examination - 2018

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

- Q-1 (a) Define the divergence of a vector field and show that $\text{div } \vec{V} = \nabla \cdot \vec{V}$ 8
- (b) If $\Phi(x,y,z) = 3x^2y - y^3z$ find $\text{grad}\Phi$ at the point $(1_1 - 2_1 1)$. 5
- (c) Define gradient of a scalar field. 2
- Q.2 (a) What is a rotor. Find a relation for tangential velocity to prevent slipping. Discuss how this velocity depletes on different parameters. 8
- (b) Consider a rotor of radius 2m. It is given that coefficient of friction between material of clothing and rotor wall is 0.40. Find speed of object, time period and frequency of rotor. 5
- (c) What is pseudo force? 2
- Q.3 (a) What is work. How work done is found by a variable force. 8
- (b) A running man has kinetic energy that a boy of half of his mass. The man speeds up by 1m/s and then has same kinetic energy as the boy. What is original speed of the man? 5
- (c) Suppose that the earth revolves around Sun in a perfectly circular orbit. Does sun do any work on the earth? 2
- Q.4 (a) State and explain the law of periods of planets? 8
- (b) What minimum initial speed must a projectile have at surface of earth if it is to escape the earth? Ignore effects of friction and rotation of earth. 5
- (c). Why acceleration due to gravity near polar region is greater than that at equatorial? 2

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Section II

- Q. 5 (a) What is simple pendulum? Derive a relation for its time period. 8
- (b) Consider a block-spring system in which spring constant of spring is 221 N/m and mass of block is 2.43kg. The block is stretched in the x-direction a distance of 11.6cm from equilibrium and released. What is total energy in the system? 5
- (c) Is it possible to have damped oscillations when a system is at resonance? 2
- Q.6.(a) Explain how electromagnetic waves are added by phasor method. 8
- (b) Monochromatic green light of wave length 554 nm illuminates two parallel narrow slits 7.7 μm apart. Calculate the angular position of third order fringe in radians. 5
- (c) In Young double slit experiment, if distance between the slits is halved and distance between slit and screen is double, then find change in fringe width. 2
- Q.7 (a) What is diffraction grating. Derive and explain its equation. 8
- (b) Slit of width d is illuminated by white light. For what value of d does the first minimum for light of 650 nm fall at $\theta = 15^\circ$? 5
- (c) How will the sky appear if there had been no atmosphere? 2

Section III

- Q.8 (a) On the basis of kinetic theory of gases, derive a relation for pressure of gas. 8
- (b) Find root means square speed of Hydrogen gas at S.T.P, assuming it to be an ideal gas. ($\rho = 8.99 \times 10^{-2} \text{ kg / m}^3$) 5
- (c) Is it possible to get a diffraction pattern due to a wide slit? 2
- Q.9 (a) Discuss distribution of molecular speeds in detail, of an ideal gas. 8
- (b) Find average translational kinetic energy of individual nitrogen molecules at 1327 $^\circ\text{C}$ in eV. 5
- (c) The speeds of group of ten particles as follows: two particles are moving at 500 m/s, four are moving at 200 m/s and four are moving at 600 m/s. Calculate v_{rms} . 2
- Q.10 (a) What is first law of thermodynamics? Also discuss its physical significance and limitation of this law. 8
- (b) In an experiment 1.35 mole of oxygen are heated at constant pressure starting at 284K. How much heat must be added to the gas to double its temperature? 5
- (c) Can heat be added to a system without causing temperature of the substance to rise? 2