



# UNIVERSITY OF THE PUNJAB

First Semester – 2019

Examination: B.S. 4 Years Program

Roll No. in Fig. ....

Roll No. in Words. ....

PAPER: Mechanics and Wave Motion (IT)  
Course Code: PHY-121 Part – I (Compulsory)

MAX. TIME: 15 Min.  
MAX. MARKS: 10

Signature of Supdt.:

**Attempt this Paper on this Question Sheet only.**

**Please encircle the correct option. Division of marks is given in front of each question.**

**This Paper will be collected back after expiry of time limit mentioned above.**

**Q.1. Encircle the right answer, cutting and overwriting is not allowed. (1x10=10)**

- The unit of work or energy in S.I. units is \_\_\_\_\_  
(a) newton (b) Pascal (c) joule (d) None of these
- Trajectory of the Projectile is \_\_\_\_\_  
(a) Ellipse (b) Hyperbola (c) parabola (d) none of these
- A force is completely defined when we specify  
(a) magnitude (b) direction (c) point of application  
(d) all of the above
- Which of the following is not a scalar quantity  
(a) time (b) mass (c) volume (d) acceleration.
- The coefficient of friction depends on  
(a) area of contact (b) shape of surfaces  
(c) nature of surface (d) none of these
- Magnetically levitated train is a good example of  
(a) frictional motion (b) frictionless motion  
(c) high speed motion (d) low speed motion
- Which of the following statements is false?  
(a) In a simple pendulum the form of energy changes at every point  
(b) In a simple pendulum the form of energy remains same at every point  
(c) In a simple pendulum the total energy remains conserved  
(d) In a simple pendulum the energy at mean position is equal to at extreme position  
(e) None of the above
- Time Period "T" of a conical pendulum is given as  
(a)  $2\pi\sqrt{\frac{l}{g}}$  (b)  $2\pi\sqrt{\frac{l\cos\theta}{g}}$  (c)  $2\pi\sqrt{\frac{m}{k}}$  (d)  $\frac{1}{2\pi}\sqrt{\frac{g}{l}}$  (e) none of these
- The product of frequency and wavelength of a wave is called its  
(a) amplitude (b) speed  
(c) energy (d) none of these
- In a transverse wave direction of energy transfer is \_\_\_\_\_ to direction of travel  
(a) perpendicular (b) parallel  
(c) tangent (d) all of these



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PAPER: Mechanics and Wave Motion (IT)

Course Code: PHY-121 Part – II

MAX. TIME: 2 Hrs. 45 Min.

MAX. MARKS: 50

**ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED**

## Section-II (Subjective Type)

(10 × 2 = 20)

Question no. 2: Write short answers of the following questions.

- (i) What is the difference between uniform and variable velocity. From the explanation of variable velocity, define acceleration. Give SI units of velocity and acceleration.
- (ii) Two vectors in yz plane are given as  $\mathbf{A} = -2.9 \mathbf{j} + 2.2 \mathbf{k}$  and  $\mathbf{B} = 4.3 \mathbf{j} - 1.7 \mathbf{k}$ . Find the dot product of these vectors.
- (iii) Define work. A container with a mass of 5 kg is lifted to a height of 8 m. How much work is done by the external force?
- (iv) What is projectile motion? At what point or points in its path does a projectile have its minimum speed, its maximum speed?
- (v) How are work, force and distance related?
- (vi) How can we find the center of mass of solid objects? Describe briefly.
- (vii) State the law of conservation of angular momentum.
- (viii) Does frequency depends on amplitude for harmonic oscillators? Discuss briefly.
- (ix) If a mass spring system is hung vertically and set into oscillations, why does the motion eventually stop?
- (x) Differentiate between longitudinal and transverse wave.

Question No. 3:

(6+4)

- (a) Explain Newton's first, second law and third law of motion.
- (b) A plane is moving with 720km/h. if its mass is 16000kg, find its kinetic energy.

Question No. 4:

(6+4)

- (a) State and prove work energy theorem.
- (b) A car travels with a constant speed of 15 m/s. The car's engine produces a 4000 N pushing force in order to keep the speed constant. Find the power is developed by the engine.

Question No. 5:

(6+4)

- (a) What are damped oscillations? Describe the energy of damped oscillator with the help of graphs. Derive a relation for its frequency.
- (b) An oscillating block-spring system has a mechanical energy of 1.00 J, an amplitude of 10.0 cm, and a maximum speed of 1.20 m/s. Find the spring constant, the mass of the block, and the frequency of oscillation.