S.B. Roll No. _____

APPLIED PHYSICS-I

1st Exam/Common/2355/Dec-2011

Duration: 3 Hrs.   Max. Marks: 75

Section-A

Q1. A) Choose the correct answer   **5**

(i)   The wave length associated with a particle of mass 'm' and moving with velocity V is given by

$\lambda = \dfrac{h}{mv}$ where 'n' is Planck's constant. The dimensional formula of 'n' is

(a) ML^2T (b) $M^1L^{-1}T^{-1}$

(b) ML^1T^{-1} (c) ML^2T^{-1}

(ii) If $\left|\vec{A} \times \vec{B}\right| = \vec{A}.\vec{B}$ then angle between $\vec{A}$ and $\vec{B}$ is

(a) 0   (b) $\pi/4$

(c) $\pi/2$ (d) $5\pi/4$

(iii) A body is not in transletory equilibrium when
(a) Resultant force on it is zero   (b) It is at rest
(c) It is in accelerated motion   (d) It is in uniform motion

(iv) A boat anchor is rocked by waves whose crests are 100m apart and whose velocity is 25m/s. These waves strike the boat once every:
(a) 2500sec   (b) 0.25sec
(c) 1500sec   (d) 4sec.

(v) Hydrogen and nitrogen are at the same temperature. The modules of which one of them will have more average K.E?
(a) Hydrogen   (b) Nitrogen
(c) Both have equal K.E   (d) Depends upon actual value of temperature.

B)   State true or false   **5**

(i)   All molecular motion ceases at 0°C

(ii) All materials expand when heated

(iii) Steel is more elastic than rubber.

(iv) All parts of a rotating wheel have same angular acceleration.

(v)   A cyclist cannot negotiate a curve without bending himself.

C) Fill in the blanks   **5**

(1)   If a light and a heavy body have equal K.E, the lighter body has _____ momentum.

(2)   If normal reaction is doubled, the co-efficient of friction is _____

(3)   If $\vec{A} + \vec{B} = \vec{A} - \vec{B}$ then $\vec{B}$ is a _____ vector.

(4)   W = Mass X _____ X _____

(5)   When sand is poured on a rotating disc its angular velocity will _____

Section-B

Q2.   Attempt any six questions   6x5=30

(i)   The frequency of vibration (v) of a stretched string depends upon the load applied T, length l, and its mass per unit length µ. Find dimensionally the formula of frequency.

(ii) Find a unit vector that perpendicular to both $\vec{A}$ and $\vec{B}$ where $\vec{A} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{B} = \hat{i} - \hat{j} + 2\hat{k}$

(iii) State and prove Newton's third law of motion

(iv) A ball is dropped from rest at a height of 12m. If it loses 25% of its K.E on striking the ground, what is the height to which it bounces? How do you account for this loss in K.E?

(v)   What do you mean by banking of roads? Why is it done? A train has to negotiate a curve of radius 400m. By how much the outer rail is raised as compared with the inner rail for a speed of 48km/n? Given that the distance between the rail is 1m.

Contd...

(vi) Derive and expression of terminal velocity for a spherical body of radius 'r', density 'ρ' moving through a fluid of density 'σ'.

(vii) A layer of ice 20mm thick has formed on a pond. The temperature of air is -20°C. Find how long will it take for another 1mm layer of ice to form. Given thermal conductivity of ice 0.008 cgs units. Density of ice =1g/cm³

Section-C

Q3.   Attempt any three questions   10x3=30

(1) (a) Distinguish between streamline and turbulent flow.
    (b) State and prove Bernoulli's theorem   7

(ii) What are ultrasonic's? Explain how these are produced by piezoelectric method. Give two applications of ultra Sonics.

(iii) (a) What are systematic errors? Explain with example different types of systematic errors. How can each of these be minimized?

(b) The young's modulus (y) of a material is given by the relation $y = \dfrac{Mgl}{\pi r^2 l}$. If the percentage error in W (=Mg), L, r and l are 0.5%, 1%, 3%, 4% respectively. What is the percentage error in y.

(iv) (a) Distinguish among positive, negative and zero work done? Give example of each.
     (b) Define power obtain expression of power in terms of force and velocity?
     (c) What should be the power of an engine required to lift 90 tonnes of coat per hour from a mine whose depth is 200m? g = 9.8m/s², 1 tonne = 1000kg)

(v) (a) Define the terms torque and angular momentum. What is the relation between the two?
    (b) A man sitting at the centre of a rotating table with his arms out stretched. Angular speed of table is 40rpm. If the man folds his hands to reduce his moment of inertia to 2/5 of its initial value, what will be new angular speed?