



**MBE-003-1011002**

Seat No. \_\_\_\_\_

**B. Sc. (Sem. I) (CBCS) Examination**

**November / December – 2016**

**Physics : Paper - 101**

*(New Course)*

**Faculty Code : 003**

**Subject Code : 1011002**

Time :  $2\frac{1}{2}$  Hours]

[Total Marks : 70

- Instructions :**
- (1) All the question are compulsory
  - (2) Give answers of all questions in answer book only.
  - (3) Figures on the right side indicate full marks.

1 (a) Answer following objective questions : 4

- (1) What is the basic difference between vector and scalar ?
- (2) If the angle between two vectors is  $90^\circ$ , their scalar product will be \_\_\_\_\_.
- (3) What will be the phase difference between voltage and current in case of a pure resistor ?
- (4) What is secondary cell ?

(b) Answer any one question : 2

- (1) If  $|\vec{A} + \vec{B}| = |\vec{A} - \vec{B}|$  then show  $\vec{A} \perp \vec{B}$
- (2) A  $1 \mu F$  capacitor is connected in series with  $2 m\Omega$  resistor to a 300 volt d.c. source. Determine the initial charging current and final charge.

(c) Answer any one question : 3

- (1) Explain the resolution of vectors in a plane.
- (2) How much time it will take for voltage to decay from 100 V to 50 V in an R-C series circuit of time constant 1 sec ?

- (d) Answer any one in detail : 5
- (1) Describe vector triple product.
  - (2) Obtain an expression for growth and decay of charge on R-C circuit.
- 2 (a) Answer following objective questions. 4
- (1) In a semiconductor, current conduction is due to\_\_\_\_\_.
  - (2) With forward bias to a pn junction, the width of depletion layer \_\_\_\_\_.
  - (3) Define intrinsic semiconductor.
  - (4) What is doping ?
- (b) Answer any one question : 2
- (1) Explain how the energy bands form ?
  - (2) Explain the effect of temperature on extrinsic semiconductor.
- (c) Answer any one question. 3
- (1) Write note on an ideal diode.
  - (2) Explain zener break down mechanism.
- (d) Answer any one : 5
- (1) Give the energy band description of conductor, semiconductor and insulators.
  - (2) Discuss the behaviour of p-n junction under forward and reverse biasing.
- 3 (a) Answer following objective questions. 4
- (1) What is potential energy ?
  - (2) State work energy theorem.
  - (3) What is centre of mass ?
  - (4) Give the statement of Newton's third law of motion.
- (b) Answer any one : 2
- (1) A body of mass 300 gm moves with velocity  $3\hat{i} + 4\hat{j} m/s$ . What is the kinetic energy of this body ?
  - (2) Two particles of mass 1 kg and 3 kg have position vector  $2\hat{i} + 3\hat{j}$  and  $-2\hat{i} + 3\hat{j} - 4\hat{k}$  respectively. Find the centre as mass.

- (c) Answer any one : 3
- (1) How much work is to be done to produce a velocity of 50 km/h to a bus of mass 2000 kg ?
  - (2) Three particles of mass 1, 2 and 3 kg respectively are placed in x-y plane at positions (1, 2), (-2, 4) and (-1, 2). The forces acting on them are  $-2\hat{i} + 3\hat{j}$ ,  $3\hat{j} - 4\hat{i}$  and  $10\hat{i} N$  respectively. Find the position and centre of mass of the system.
- (d) Answer any one : 5
- (1) What is centre of mass ? Discuss the centre of mass for two and several particles in detail.
  - (2) Discuss the elastic and inelastic collision.
- 4 (a) Answer following objective questions. 4
- (1) If frequency of rotating body is doubled and its mass is reduced to half then its angular momentum is \_\_\_\_\_.
  - (2) The moment of inertia plays the same role in rotational motion as the mass plays in linear motion. Is it true or not ?
  - (3) Write the statement of the Kepler's law.
  - (4) The value of escape velocity on the surface of the earth is \_\_\_\_\_ km/s.
- (b) Answer any one : 2
- (1) On applying a torque, a flywheel acquires an angular speed of 50 revolution in 10.5 sec. If moment of inertia of flywheel is  $5 \text{ kg m}^2$  then calculate the torque acts on it.
  - (2) A satellite is travelling at a 7000 km from the surface of the earth calculate the orbital velocity of the satellite. (Radius of the earth =  $6.38 \times 10^6 \text{ m}$ )
- (c) Answer any one : 3
- (1) Find the moment of inertia for rectangular bar.
  - (2) Derive the equations of velocity and time period of a satellite.

- (d) Answer any one : 5
- (1) State and prove the theorems of momentum of inertia.
  - (2) Write short note on Kepler's laws for planetary motion.
- 5 (a) Answer following objective questions : 4
- (1) Define : Amplitude and time period.
  - (2) What is damped oscillation ?
  - (3) What is the unit of strain ?
  - (4) What are the theoretical values of Poisson's ratio ?
- (b) Answer any one : 2
- (1) A load of 8 kg is suspended from a support using a wire of radius 0.2 cm, find the tensile stress at equilibrium (Take  $g = 3.1 \pi \text{ m/s}$ )
  - (2) Determine the magnitude of the restoring force for a pendulum of mass 100 g that been pulled to an angle of  $10^\circ$  from the vertical. (Take  $g = 9.81 \text{ m/s}^2$ ).
- (c) Answer any one : 3
- (1) Write short note on 'Poisson's ratio'.
  - (2) Explain damped oscillations.
- (d) Answer any one : 5
- (1) State Hook's law and explain modulus of elasticity in detail.
  - (2) Explain conservation of energy in simple harmonic motion.
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