PBM-003-0011002   Seat No. _____

First Year B. Sc. (Sem. I) (CBCS) Examination

November / December - 2018

Physics : P - 101

(Mechanics & Semiconductor Electronics)

Faculty Code : 003

Subject Code : 0011002

Time : $2\frac{1}{2}$ Hours]   [Total Marks : **70**

1   (a)   Answer all the following objective questions :   **4**

(1)   Which type of the quantity Temperature is ?

(2)   If $\vec{A} = 5\hat{i}$ and $\vec{B} = 3\hat{j}$ then $\vec{A} \cdot \vec{B}$ = ?

(3)   Write color code of resistor having resistance 4700 ohm.

(4)   What is the phase difference in voltage and current in case of a capacitor ?

(b)   Answer any **one** question.   **2**

(1)   Define vector and give its illustration.

(2)   Give the name of various types of capacitors.

(c)   Answer any **one** question.   **3**

(1)   Explain cross product of two vectors.

(2)   In a circuit, a resistor of $10\,M\Omega$, a capacitor of $0.2\,\mu F$ and a battery of 20 volt are connected in series. Calculate rate of growth of charge.

(d)   Answer any **one** question.   **5**

(1)   Explain integral calculus.

(2)   Obtain the expression of growth of charge in RC circuit.

2 (a) Answer all the following objective questions. **4**

    (1) Define extrinsic semiconductor.

    (2) What will be the effect of increase of temperature on Zener breakdown voltage ?

    (3) If we increase the temperature, the electrical conductivity of a conductor increases. True/False.

    (4) Define internal potential barrier.

(b) Answer any **one** question. **2**

    (1) Explain the energy band in semi conductor crystals.

    (2) Explain the break down of insulators.

(c) Answer any **one** question. **3**

    (1) Explain how an intrinsic semiconductor converted in N-type and P-type extrinsic semiconductor.

    (2) Explain the formation of a PN-junction.

(d) Answer any **one** question. **5**

    (1) Explain V-I characteristics of a PN-junction diode.

    (2) Explain V-I characteristics of a Zener diode.

3 (a) Answer all the following objective questions. **4**

    (1) Define conservative force.

    (2) Define center of mass.

    (3) Define coefficient of restitution.

    (4) Define inelastic collisions.

(b) Answer any one question. **2**

    (1) Calculate the horse power (hp) needed to pumping 3000 kg water per minute from a well 20 meter deep to the surface.

    (2) A 20 gm bullet travelling with 100 m/s penetrates 10 cm into a wooden block. What will be average force it exerts on the block ?

(c) Answer any **one** question. 3

(1) Explain Newton's laws of motion.

(2) Two bodies of masses 10 kg and 2 kg are moving with velocities $2\hat{i} - 7\hat{j} + 3\hat{k}$ and $-10\hat{i} + 35\hat{j} - 3\hat{k}$ m/s respectively. Find the velocity of the centre of mass.

(d) Answer any **one** question. 5

(1) Explain the principle of conservation of linear momentum. In the absence of external forces acting, show that linear momentum of a system of particles is constant.

(2) Define elastic collision. Discuss one dimensional elastic collision and obtain an expression for the final velocity of two colliding bodies.

4 (a) Answer all the following objective questions. 4

(1) What is rotational motion ?

(2) Write the value of gravitational constant.

(3) Define escape velocity.

(4) The Gravitational potential and gravitation potential energy at infinite distance are zero (True or False)

(b) Answer any **one** question. 2

(1) On applying a torque, a flywheel acquires an angular speed of 50 revolutions in 10s. If moment of inertia of flywheel is 8 kg/m² then calculate the torque act on it.

(2) A satellite is travelling at a distance of 7000 km from the surface of the earth, calculate the orbital velocity.

(c) Answer any **one** question. 3

(1) Explain Newton's law of gravitation.

(2) State and prove Kepler's third law of planetary motion.

(d) Answer any **one** question. **5**

    (1) Explain the angular momentum of a rigid body and prove that $\tau = I\alpha$.

    (2) State and prove theorems of moment of inertia.

5 (a) Answer all the following objective questions. **4**

    (1) Define simple harmonic motion.

    (2) On which factors the total mechanical energy of a simple harmonic motion depends ?

    (3) What are the theoretical values of Poisson's ratio ?

    (4) Define strain.

(b) Answer any **one** question. **2**

    (1) A particle of mass 100 gram executes a simple harmonic motion. The restoring force is provided by a spring constant 80 N/m. Find the period.

    (2) 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 $g = 3.1\pi \, m/s^2$.

(c) Answer any **one** question. **3**

    (1) Explain Young's modulus.

    (2) Describe the energies possessed by a simple harmonic motion.

(d) Answer any **one** question. **5**

    (1) Explain : Damped harmonic oscillation.

    (2) Explain various elastic constant.

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