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

November / December - 2017

Physics : P - 101

(Mechanics & Semiconductor Electronics)

(New Course)

Faculty Code : 003

Subject Code : 0011002

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

Instructions : (1) All the questions are compulsory.

(2) Give answer of questions in answer book.

(3) Figures on the right side indicate full marks.

1   (a)   Answer the following short questions :   **4**

(1)   What is opposite vector ?

(2)   If the product of two vector quantities result in to a vector then the product is called a _____ product.

(3)   What is the unit of Inductance ?

(4)   Write the name of any two passive components in electronics circuits.

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

(1)   State the properties of the scalar product of vectors.

(2)   Explain discharging of capacitor in RC circuit.

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

(1)   If $\left|\vec{A} + \vec{B}\right| = \left|\vec{A} - \vec{B}\right|$ then prove $\vec{A} \perp \vec{B}$.

(2)   What is RC Time Constant ? If A 10 $m\,\Omega$ resister is connected in series with a $1.0\,\mu F$ capacitor and battery with emf 12 V, find out the value of time constant.

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

    (1) Explain vector product of vectors and its properties.

    (2) Explain in detail charging of capacitor.

2 (a) Answer all questions : 4

    (1) A semiconductor has generally _____ valance electron.

    (2) What is doping ?

    (3) Draw the symbol of (i) PN diode and (ii) Zener diode.

    (4) What is depletion region ?

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

    (1) What is zener break down ?

    (2) Define knee voltage of a PN junction diode.

(c) Answer any **one** : 3

    (1) Explain idol diode.

    (2) Explain zener diode.

(d) Answer any **one** : 5

    (1) Explain in detail energy band of conductor, semiconductor and insulator.

    (2) Explain in detail PN junction diode under forward and reverse biased.

3 (a) Answer all the questions : 4

    (1) State : Newton's second law of motion.

    (2) Define Inertia.

    (3) State : Newton's first law of motion.

    (4) What is conservative force ?

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

    (1) Explain frame of reference with suitable example.

    (2) Explain kinetic energy.

(c) Answer any **one** : 3

    (1) Explain work and work energy theorem.

    (2) How much work is to be done to produce a velocity of 70 km/h to a bus of mass 1000 kg.

(d) Answer any **one** : 5

    (1) Explain elastic collision in one dimension.

    (2) Derive expression for centre of mass of several group of particles.

4 (a) Answer all the questions : 4

    (1) What is a rigid body ?

    (2) Define moment of inertia.

    (3) Write Kepler's second law of planetary motion.

    (4) What is a satellite ?

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

    (1) Calculate the angular momentum of the spherical earth rotating about its own axis (mass of the earth $= 6 \times 10^{24}$ kg and mean radius $= 6.4 \times 10^6$ m)

    (2) Explain gravitational potential.

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

    (1) Derive the relation between torque and angular momentum.

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

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

    (1) Explain escape velocity in detail.

    (2) Find the moment of inertia for rectangular plate lamina.

5 (a) Answer all the questions : 4

    (1) State Hook's law.

    (2) What is Strain ?

    (3) What is Simple Harmonic motion ?

    (4) What is resonance ?

(b) Answer any **one** of question : 2

    (1) Explain Bulk modulus.

    (2) A particle of mass 200 g executes a simple harmonic motion. The restoring force is provided by a spring of spring const. $80\,\text{Nm}^{-1}$ find the time period.

(c) Answer any **one** of question : 3

    (1) A wire 3 m long and $0.625\,\text{cm}^2$ in cross - section is found to stretch 0.3 cm under a tension of 1200 kg. What is the Young's modulus of the material of the wire.

    (2) Define time period, frequency and Amplitude with Simple harmonic motion.

(d) Answer any **one** of question : 5

    (1) Describe an experiment for the determination of Young's modulus by Searle's method.

    (2) Discuss on damped Harmonic oscillation in detail.

———————