



JAR-003-2011002

Seat No. _____

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

December – 2019

Physics : Paper-101

(Mechanics & Semiconductor Electronics)

(New Course)

Faculty Code : 003

Subject Code : 2011002

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

[Total Marks : 70

Instructions :

- (1) All the questions are compulsory.
- (2) Figures on the right side indicate full marks.

- 1 (a) Answer all the following objective questions : 4
- (1) Define scalar quantities.
 - (2) Define unit vector
 - (3) Write the unit of capacitance.
 - (4) Define constant voltage source.
- (b) Answer any **one** question : 2
1. Define scalar product of two vectors and write its properties.
 2. If in d.c. R-C circuit the $R=2000k\Omega$ and $C=10\mu F$, find the value of time constant.
- (c) Answer any **one** question : 3
1. Find the magnitude of $\vec{A} + \vec{B}$ where
 $\vec{A} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{B} = 4\hat{i} + 5\hat{j} + 3\hat{k}$.
 2. Find the scalar product of vectors, $\vec{A} = 3\hat{i} + 2\hat{j} + 5\hat{k}$
and $\vec{B} = 2\hat{i} + 4\hat{j} + 2\hat{k}$.
- (d) Answer any **one** question. 5
1. Explain differential calculus as rate measurer.
 2. Explain in detail the discharging of a capacitor in R-C circuit.

- 2 (a) Answer all the following objective questions : 4
1. What is doping ?
 2. Which type of impurity is used to develop P-type semiconductor?
 3. What is Zener break down?
 4. The most commonly used semiconductor is.....
- (b) Answer any **one** question : 2
1. Explain the formation of PN junction.
 2. Explain metal, insulator and semiconductor.
- (c) Answer any **one** question : 3
1. Explain forward bias characteristics of PN junction diode.
 2. Explain conduction in intrinsic semiconductor,
- (d) Answer any **one** question : 5
1. Explain Zener diode.
 2. Discuss the effect of temperature on conductivity of intrinsic and extrinsic semiconductor.
- 3 (a) Answer all the following objective questions : 4
1. State work-energy theorem.
 2. Give the definition of conservative force.
 3. Write the definition of elastic collision.
 4. State Newton's first law of motion.
- (b) Answer any **one** question : 2
1. If the net horizontal force of 200 N is applied to a body having mass 50 kg resting on a smooth horizontal surface, calculate the horizontal acceleration produced in the body.
 2. Explain Newton's second law of motion.
- (c) Answer any **one** question. 3
1. Explain in detail the calculation of work done by constant force.
 2. What magnitude of net horizontal force is required to move a toy-car having mass 100 gram on a smooth horizontal surface with acceleration 1.5 cms^{-2} ?
- (d) Answer any **one** question : 5
1. Derive an equation of the final velocity of the Rocket at time 't'.
 2. Explain elastic collision in two dimensions.

- 4 (a) Answer all the following objective questions : 4
1. Define angular velocity.
 2. The unit of torque is.....
 3. Define gravitational potential.
 4. State Kepler's first law of motion of planets.
- (b) Answer any **one** question : 2
1. Calculate the angular momentum of the earth rotating about its own axis having moment of inertia 9.8×10^{37} kg.M² with angular velocity 7.3×10^{-5} radian per second.
 2. Explain Newton's law of gravitation.
- (c) Answer any **one** question : 3
1. Derive the expression of moment of inertia of rectangular plan lamina.
 2. A sphere of mass 20 kg is attracted by another sphere of mass 15 kg and their centers are separated by 1m. Calculate the gravitational force of attraction. [G= 6.67×10^{-11} Nm²kg⁻²].
- (d) Answer any **one** question : 5
1. State and prove Parallel axis theorem of moment of inertia.
 2. Explain escape velocity in detail.
- 5 (a) Answer all the following objective questions : 4
1. Define stress.
 2. Define Poisson's ratio.
 3. Define simple harmonic motion.
 4. Write the unit of force constant.
- (b) Answer any **one** question : 2
1. A cylindrical wire having length 3m long and cross-section area 0.5×10^{-4} m² is found to stretch 0.2×10^{-2} m under a tension of 12000 N. What is the Young's modulus of the material of the wire?
 2. The restoring force acting on a particle executing simple harmonic motion is 4N when it is 0.05 m away from the centre of oscillation. Find the spring constant..

- (c) Answer any **one** question : **3**
1. Write short note on Bulk modulus.
 2. Explain conservation of energy in SHM.

- (d) Answer any **one** question : **5**
1. Explain stress-strain diagram.
 2. Discuss Forced oscillation.
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