



JAR-003-0011002

Seat No. _____

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

December – 2019

Physics : 101

(Mechanics & Semiconductor Electronics) (New Course)

Faculty Code : 003

Subject Code : 0011002

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

[Total Marks : 70

Instructions :

- (1) All questions are compulsory.
- (2) Symbols have their usual meanings.
- (3) Figures to the right indicate marks.

1 (a) Answer the following in short : 4

(1) For a vector \overrightarrow{PQ} , $\overrightarrow{PQ} = \overrightarrow{QP}$ Yes or No.

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

(3) What is called active components ?

(4) What will be the internal impedance of an ideal voltage source ?

(b) Answer in brief : (any one) 2

(1) Explain addition of two vectors.

(2) Give the classification of MOSFET.

- (c) Answer in detail : (any one) 3
- (1) Prove that $(A \times B) \times C + (B \times C) \times A + (C \times A) \times B = 0$.
 - (2) How long will it take for voltage to drop from 100 V to 50 V in a RC series circuit of time constant 1 sec ?
- (d) Answer in detail : (any one) 5
- (1) Describe Vector triple product.
 - (2) Obtain the expression of growth and decay of charge in RC circuit.
- 2 (a) Answer the following in short : 4
- (1) What is semiconductor material ?
 - (2) Define intrinsic semiconductors.
 - (3) Write basic difference between ordinary PN diode and zener diode.
 - (4) What happens to electrical resistivity of a semiconductor if temperature is increased ?
- (b) Answer in brief : (any one) 2
- (1) What is dynamic resistance of a diode ?
 - (2) Explain ideal diode.
- (c) Answer in detail : (any one) 3
- (1) Explain the energy bands in insulator, semiconductor and conductor.
 - (2) What is P-Type and N-Type semiconductor material ?
- (d) Answer in detail : (any one) 5
- (1) Explain V-I characteristic of a P-N Junction diode.
 - (2) Explain V-I characteristic of a zener diode in detail.

- 3 (a) Answer the following in short : 4
- (1) State : Newton's third law of motion.
 - (2) Write two main categories of collision.
 - (3) Define coefficient of restitution.
 - (4) Define work and power.
- (b) Answer in brief : (any one) 2
- (1) Explain Newton's second law of motion.
 - (2) Define potential energy and obtain an expression for it.
- (c) Answer in detail : (any one) 3
- (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 wooden block, what will be average force it exerts on the block ?
- (d) Answer in detail : (any one) 5
- (1) Describe the system of variable mass and rocket propulsion.
 - (2) Explain the principle of conservation of linear momentum in the absence of external force acting, show that linear momentum of a system of particle is constant.
-
- 4 (a) Answer the following in short : 4
- (1) Write definition of moment of inertia.
 - (2) State : Kepler's second law of planetary motion.
 - (3) Torque acting on the particle is maximum when angle between \vec{r} and a \vec{F} is ?
 - (4) What is escape velocity ?
- (b) Answer in brief : (any one) 2
- (1) Explain angular acceleration.
 - (2) Explain the state of weightlessness.

- (c) Answer in detail : (any one) 3
- (1) The MI of a body of mass 10 kg about an axis 2 cm away from its CM is 50 kg m^2 , find its MI about a parallel axis 3 m away from its CM.
 - (2) If an application of break to a car running with a linear velocity 72 km/hr it stops after 15 sec. due to constant angular retardation, find the angular acceleration of the wheels, if the radius of wheels is 60 cm.
- (d) Answer in detail : (any one) 5
- (1) Explain angular momentum of a rigid body and prove that $\vec{\tau} = I\vec{\alpha}$.
 - (2) State and prove the theorems of moment of inertia.
- 5 (a) Answer the following in short : 4
- (1) Define strain.
 - (2) What are the theoretical value of Poisson's ratio ?
 - (3) Define restoring force of a spring.
 - (4) In a simple pendulum, what happens if θ is not small enough ?
- (b) Answer in brief : (any one) 2
- (1) Explain elasticity and its types.
 - (2) Define damped harmonic motion and discuss the factors affecting on it.
- (c) Answer in detail : (any one) 3
- (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 $g = 9.8 \text{ m/s}^2$.
 - (2) The resultant force acting on a particle, performing simple harmonic motion is 1 N when it is 2 cm away from the mean position, find the spring constant.
- (d) Answer in detail : (any one) 5
- (1) Explain various types of strains.
 - (2) Explain the total mechanical energy is conserved in simple harmonic motion.