DCW-003-2011002 Seat No. _____

B. Sc. (Sem. I) (W.E.F. 2019) Examination

August – 2022

Physics-101

Mechanics & Semiconductor Electronic

(Mechanics & 4 Sem. Electronics)

[New Course]

Faculty Code : 003

Subject Code : 2011002

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

Instructions : (i) Attempt any five questions.
(ii) Figures on right side indicate marks.
(iii) Notation have their usual meanings.

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

(1) Give name of any two vector quantities.

(2) Define equal vector.

(3) If the angle between $\vec{A}$ and $\vec{B}$ is 90° then $\vec{A} \cdot \vec{B} =$ _____.

(4) Temperature is vector quantity. (True/False)

(b) $\vec{A} = 5\hat{i} + \hat{j} - 2\hat{k}$, find unit vector of $\vec{A}$. **2**

(c) Explain addition of vector. **3**

(d) Explain vector product of two vector describe the properties of vector product. **5**

2 (a) Answer all the following short questions : **4**

(1) What is the unit of resistance.

(2) An ideal voltage source has _____ internal resistance.

(3) Draw the symbol of capacitor.

(4) What is the unit of induction.

(b) A resistance has colour band sequence green, yellow and organge and silver find the value of resistor. **2**

(c) Explain the concept of voltage source. **3**

(d) Explain charging and discharging of capacitor. **5**

3 (a) Answer all the following short questions : **4**

(1) How many valence electron in trivalent impurity ?

(2) A semiconductor has nagative resistance coefficient. (True/False)

(3) Define intrinsic semiconductor.

(4) The gap between valance band and conduction band is called _____.

(b) Explain crystal structure of intrinsic semiconductor. **2**

(c) Explain energy band gap in solid metal, insulator and semiconductor. **3**

(d) Explain N-type and P-type semiconductor. **5**

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

(1) What is doping ?

(2) Draw the symbole of P-N junction diode.

(3) What is the forward bias condition of P-N junction diode ?

(4) What is deplation layer ?

(b) Explain zener effect. **2**

(c) Explain V-I characteristics of P-N junction diode. **3**

(d) Explain zener diode. **5**

5 (a) Answer all the following short questions : **4**

(1) Write the Newton's second law of motion.

(2) M.K.S. unit of energy is _____.

(3) If p = momentum, t = time then $\frac{dp}{dt}$ = ____.

(4) C.G.S. unit of force is _____.

(b) Calculate the force to accelarate 2 m/s^2 of 100 kg box. **2**

(c) State and prove work-energy theorem. **3**

(d) Explain the calculation of work-done in **5**

(1) constant force

(2) spring force

6 (a) Answer all the short questions : **4**

(1) State Newton's third law of motion.

(2) Define conservative force.

(3) Write the unit of momentum.

(4) What is the m.k.s. unit of mass ?

(b) Calculate the work to produce velocity 100 m/s to an object of mass 200 kg. **2**

(c) Explain kinetic energy. **3**

(d) Explain rocket propulsion. **5**

7 (a) Answer all the following short questions : **4**

(1) Write the unit of angular velocity.

(2) What is rigid body ?

(3) Write the unit of moment of inertia.

(4) The direction of torque can be determine from which rule ?

(b) Calculate the maximum torque acting on particle when force $F = 2N$ and distance $r = 4$m. **2**

(c) Explain angular velocity and angular accelaration. **3**

(d) Explain moment of inertia and derive the relation $\tau = I\alpha$. **5**

8 (a) Answer all the following short questions : **4**

(1) State Newton's law of gravitation.

(2) Write the value of gravitational constant 'G'.

(3) What is satellite ?

(4) State kepler's first law of planetary motion.

(b) Calculate the potential energy of Earthsun system 2

$\left(M_s = 1.98 \times 10^{30} kg, M_e = 6 \times 10^{24} kg, r = 1.6 \times 10^{11} m\right)$.

(c) Explain escape velocity from the earth. 3

(d) State and explain kepler's second and third law of planetary motion. 5

9 (a) Answer all the following short questions : 4

(1) Define elasticity.

(2) What is the M.K.S. unit of stress.

(3) Strain has no unit. (True/False)

(4) State Hook's law.

(b) A wire 3m long and 0.625 m^2 cross-section is found to stretch 0.3cm under the tension 1200 kg calculate the young modulus of wire. 2

(c) Explain Poisson's ratio. 3

(d) Explain young modulus experiment by searls methode and derive the formula. 5

10 (a) Answer all the following questions : 4

(1) Define simple harmonic motion.

(2) Define trequency.

(3) Write the unit of time periode.

(4) What is resonance ?

(b) If frequency of oscillation is 2 Hz then find the time periode and angular frequency of oscillation. 2

(c) Explain simple harmonic motion as a projection of circular motion. 3

(d) Explain damped oscillations. 5