2020-21

Time - 3 hours

Full Marks - 60

*Answer **all groups** as per instructions.*
Figures in the right hand margin indicate marks.

GROUP – A

1. Answer all questions or fill in the blanks as required. [1 × 8

(a) The dimensional formula for force of surface tension is _____ .

(b) In an adiabatic process _____ of the body remains constant.

(c) For a perfectly black body, the absorptive power is _____

(d) The velocity of sound _____ with rise in temperature.

(e) In n-type semiconductor _____ impurity is added to an intrinsic semiconductor.

(f) What is the value of G in M.K.S. unit ?

(g) Write the relation between Young's modulus of elasticity, Bulk's modulus of elasticity and modulus of rigidity.

(h) What is the relation between electric field intensity (E) and potential difference (V) ?

GROUP – B

2. Answer any eight of the following questions within three sentences each. [1½ × 8

(a) Write down the expression for Lorentz force.

(b) Write down the Fleming's right hand thumb rule.

(c) Efficiency of which rectifier is more and why ?

(d) Explain why the channel of FET cannot be zero.

(e) Write down the differential form of Gauss law.

(f) What do you mean by steady state of a conducting bar ?

(g) Which of the two E or I will lead in case the circuit contains R and L ?

(h) Write down the relation between α and β of a transistor.

(i) What is transient current ?

(j) How does entropy change in an irreversible process ?

(k) Under what condition, the angle of contact is going to be acute or obtuse.

GROUP – C

3. Answer any eight of the following questions within 75 words each. [2 × 8

(a) What do you understand by reduced mass ?

(b) State and prove perpendicular axis theorem.

(c) Why the raindrop is spherical in nature ?

(d) State Stefan's law of heat radiation.

(e) What is critical damped motion ?

(f) Show that the melting point of a substance increases on increase in pressure.

(g) The equation of motion of a particle vibrating in S.H.M. is given by $y = 10 \sin(3t + z)$. What is its time period ?

(h) State and prove Gauss theorem of electrostatics.

(i) How is particle velocity related to phase velocity ?

(j) Write Faraday's law of electromagnetic induction.

GROUP – D

*Answer **any four** questions within 500 words each.*

4. Derive an expression for the moment of inertia of a solid cylinder about its axis of symmetry. [6

5. Obtain an expression for the gravitational potential at any point due to a spherical cell when the point lying inside the cell. [6

6. Derive a relation between Young's modulus of elasticity, modulus of rigidity and Poisson's ratio. [6

7. Derive energy density in a simple harmonic plane progressive wave. [6

8. What is Clausius-Clapeyron's equation ? How will you derive it using Maxwell's relation ? [6

9. State Planck's law of heat radiation and obtain Wein's displacement law from it. [6

10. Write Ampere's circuital law. Find out magnetic field due to a toroidal solenoid. [6

11. Draw the circuit diagram of common emitter transistor and find out its characteristics. [6