

**2017**

*Time : 3 hours*

*Full Marks : 75*

*Candidates are required to give their answers in their own words as far as practicable.*

*The questions are of equal value.*

*Answer any six questions, selecting three from group A, one from group B and two from group C.*

**Group – A**

1. Describe with full theory, Rankine's method of determining viscosity of liquid.
2. Distinguish between waves and ripples. Describe with theory, the ripple method of determining surface tension of a liquid.
3. What is a flat spiral spring ? Deduce the theory of measuring modules of a material in the form of a flat spiral spring.
4. What are the postulates of special theory of relativity ? Obtain Lorentz transformation equations and explain length contraction.

5. Define generalised co-ordinates. Obtain an expression for Lagrangian equation of motion for a particle.
6. What are centrifugal and coriolis forces ? Obtain the equation of motion for the rotating frame of reference.

**Group – B**

7. Deduce the expression for the speed of a compressional wave through an extended solid.
8. Show, by Fourier's analysis how the quality of a note emitted by a plucked string depends on the distance of the point of plucking.

**Group – C**

9. Deduce Maxwell's distribution law for velocities and describe experiment to verify it.
10. Deduce Maxwell's thermodynamic relations and hence deduce Clausius-Clayperon's equation.
11. Deduce Stefan-Boltzmann law from the principles of thermodynamics. Describe an experiment to verify it.
12. Write short notes on any two of the following :
  - (a) J-T Effect
  - (b) Perfect gas equation
  - (c) Absolute scale of temperature
  - (d) Superfluidity in liquid Helium

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