RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

FIRST YEAR [2019-22]

B.A./B.Sc. FIRST SEMESTER (July – December) 2019

Mid-Semester Examination, September 2019

Date : 18/09/19 **PHYSICS (GENERAL)**

Time : 11 am- 12 noon **Paper: I** Full Marks : 25

(Use a separate Answer book for each group)

GROUP – A

Answer **any three** questions of the following: [3 × 5 = 15]

1. Show vectorially that the perpendiculars drawn from the vertices of triangle on the opposite sides are concurrent . (5)

2. If $\vec{v} = \vec{\omega} \times \vec{r}$ show that $\frac{1}{2}\left(\vec{\nabla} \times \vec{V}\right) = \vec{\omega}$ where $\vec{\omega}$ is a constant vector and $\vec{r}$ is the position vector. (5)

3. Show that the time derivative of a vector $\vec{A}$ in a fixed and in a rotating coordinate systems are related as

$$\left(\frac{d\vec{A}}{dt}\right)_{fixed} = \left(\frac{d\vec{A}}{dt}\right)_{rotating} + \vec{\omega} \times \vec{A}$$

where $\vec{\omega}$ is the angular velocity of the rotating system with respect to the fixed system. (5)

4. Show that when a particle falls from a height h it will be deflected towards east by an amount $\frac{1}{3}\omega g\left(\frac{2h}{g}\right)^{3/2}\cos\theta$, where ω is the angular velocity, g is the all acceleration due to gravity and θ in the latitude of the position of Earth. (5)

5. Prove that a shear is equivalent to an extension and an equal compression in mutually perpendicular directions. (5)

GROUP – B

Answer **any two** questions of the following: [5 × 2 = 10]

6. Deduce an expression for the intensity of light at a point due to superposition of waves coming from two light sources. Hence find the condition of destructive and constructive interference . (3+2)

7. Describe a method of polarising a beam of light by reflection. (5)

8. i) An unknown solution is suspected to contain sucrose and does not contain any other optically active substance. If a 20 cm length of this solution rotates sodium light through 1°, what is the concentration of the sucrose ? Specific rotation of sucrose is 66°. (2)

   ii) How do you get bright ring at the centre in Newton's ring arrangement ? (3)

9. i) What do you mean by a half period zone ? (2)

   ii) How zone plate is made ? (1)

   iii) Write two differences between interference and diffraction? (2)

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