## **RAMAKRISHNA MISSION VIDYAMANDIRA**

(Residential Autonomous College under University of Calcutta)

B.A./B.Sc. THIRD SEMESTER EXAMINATION, DECEMBER 2014

SECOND YEAR

Date : 22/12/2014 Time : 11 am - 1 pm

## PHYSICS (General)

Paper : III

Full Marks : 50

[3×10]

## [Use a separate Answer Book for each group]

## <u>Group – A</u>

(Answer	any	<u>three</u>	questions
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a) Derive expressions for tangential component and normal component of acceleration of a particle 1. moving in a curved path. What is meant by centre of curvature and radius of curvature at a point on its path. [4+1+1]The position vector of a particle at time 't' is given by b)  $\vec{r}(t) = (6-2t)\hat{i} + (3+4t-6t^2)\hat{j} - (1+3t-2t^2)\hat{k}$  with distances given in metres and time in seconds. Find velocity and speed of the particle at time t = 3 sec. [2+2] a) What is meant by inertial and non-inertial frame of reference? Give suitable examples. [2+2]2. Find the expression of centrifugal force and coriolis force of a particle moving in a rotating frame.[3+3] b) Find the velocity, acceleration, linear momentum and equation of motion of a system of two 3. a) particles. [5] b) State and prove perpendicular axes theorem for the moment of inertial of a laminar body. [3] Calculate the fictious force and total force acting on a body of mass 10kg in a frame of reference c) descending with an acceleration of  $5 \text{ms}^{-2}$ . [2] Find the moment of inertia of a solid sphere of mass M and radius R rotating about any of its 4. a) diameter. [4] b) Prove that central force is a conservative force. [2] Show that in a central force field, the angular momentum of a particle is conserved. [2] c) d) The diameter of a disc is 3m and its mass is 9kg. Calculate the total energy when it rolls along a plane surface with a velocity of 6m/sec. [2] 5. a) Define gravitational potential and intensity. Find the relation between them. [4] b) What do you mean by gravitational self energy of a system of particles. [2] c) Find the gravitational self energy of a solid sphere. [4] Group – B (Answer any two questions) [2×10] Write down "Brewster's law of polarisation". [2] 6. a) What do you mean by double refraction? Define optic axis of a crystal. b) [3+1] The refractive indices of E-ray and O-ray of the light of wavelength 6563Å are  $\mu_0 = 1.5418$  and c)  $\mu_{e} = 1.5508$  respectively. Calculate the width of the half wave plate. [2] d) What are polaroids? Mention their uses. [2] 7. a) What do you mean by diffraction? [2] b) Explain clearly the difference between interference and diffraction. [2]

c) Show that the radius of a particular zone is proportional to the square root of the number of the zone in a zone plate. [4]

d) What is the radius of first zone of a zone plate of focal length 0.2m for a light of wave length 5000Å. [2]

<i>w</i> . [4]	
sustained interference fringe pattern. [2]	
large radius of curvature is used? [1+1]	
[4]	
) In a Newton's ring experiment two sources $S_1$ (600 nm) and $S_2$ (450 nm) are used. The n <sup>th</sup> dark ring for $S_1$ and $(n+1)^{th}$ dark ring for $S_2$ coincide. Calculate the diameter of the n <sup>th</sup> dark ring for	
[4]	
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