

**2021**  
**B.A./B.Sc.**  
**First Semester**  
 GENERIC ELECTIVE – 1  
**PHYSICS**  
*Course Code: PHG 1.11*  
 (Mechanics)

**PART-B**  
 Total Mark: 30

*Answer the following questions.*

6×5=30

1. (a) Two bodies of masses 2 gm and 10 gm have position vectors  $(3\hat{i} + 2\hat{j} - \hat{k})$  and  $(\hat{i} - \hat{j} + 3\hat{k})$  respectively. Find the position vectors and the distance of centre of mass from the origin. 4
  - (b) Two vectors  $\vec{A} = 3\hat{i} + 4\hat{j} + \hat{k}$  and  $\vec{B} = \hat{i} - \hat{j} + \hat{k}$  are perpendicular to each other. Show that  $\vec{A} \cdot \vec{B} = 0$  2
  - 2 (a) Solve the following differential equation  $\frac{dy}{dx} + xy = x$  2
  - (b) Give the expression of maximum velocity and maximum acceleration of a particle undergoing SHM. 4
  - 3 (a) Obtain the equation of motion for equivalent one body problem for two masses. 4
  - (b) Discuss the nature of motion under a central force field. 2
  - 4 (a) State and explain Kepler's laws of planetary motion. 2
  - (b) The average lifetime of a  $\pi$ -meson is  $2 \times 10^{-8}$  second. Calculate the average life when it moves with a velocity of 0.8 C. 2
  - (c) Discuss relativity of simultaneity. 2
  - 5 (a) A rod of length  $L$  and radius  $r$  is fixed at one end and at the other end a torque is applied. The rod is twisted through an angle  $\theta$ . Find the amount of work done by the torque. 3
  - (b) Obtain the expression for critical velocity. 3
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