Roll No. .....

3004

B. Tech. (Civil Engg.) 1st Semester Examination – February, 2022

MECHANICS

Paper : BSC-PHY-104-G

Time : Three Hours] *[Maximum Marks : 75*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt ***five*** questions in all selecting at least ***one*** question from each Unit. Question No. **1** is ***compulsory***.

1. (a) What is the main difference between a scalar and vector ?

   (b) Explain conservative force with an example ?

   (c) What do you mean by equipotential surface ?

   (d) What is the main difference between inertial and non-inertial frame of reference ?

   (e) Define the coefficient of friction ?

   (f) Two bodies of masses m and 4m are moving with equal kinetic energies. What is the ratio of their linear momenta ? 2.5 x 6

UNIT – I

2. (a) Explain the effect of rotational transformation on scaler and vector. 10

   (b) The polar coordinates of a point are $(r, \theta, \varphi) = 8.30°, 45°$. Find the cartesian coordinates of the same point. 5

3. (a) What do you mean by constraints motion, explain it with suitable examples. Write the equation of motion for a bead of mass m moving on a wire inclined at an angle α with the horizontal. 10

   (b) Show that Newton 2nd law is invariant under Gallian transformation. 5

UNIT – II

4. What are different type of fictitious forces in a uniformly rotating frame of reference ? And explain the effect of centrifugal force on acceleration due to gravity(g). 15

5. (a) What do you mean by damping ? Prove that damping force is independent of acceleration and displacement and is proportional to velocity. 10

   (b) What are conservative forces and drive the relationship of conservative forces and potential energy. 5

UNIT – III

6. (a) Define kinetic energy of rotation. Derive an expression between kinetic energy of rotation, moment of inertia and angular velocity. 10

(b) A circular disc of mass of mass m and radius r is set rolling on a table. If v is its linear velocity, Find out its total kinetic energy ? 5

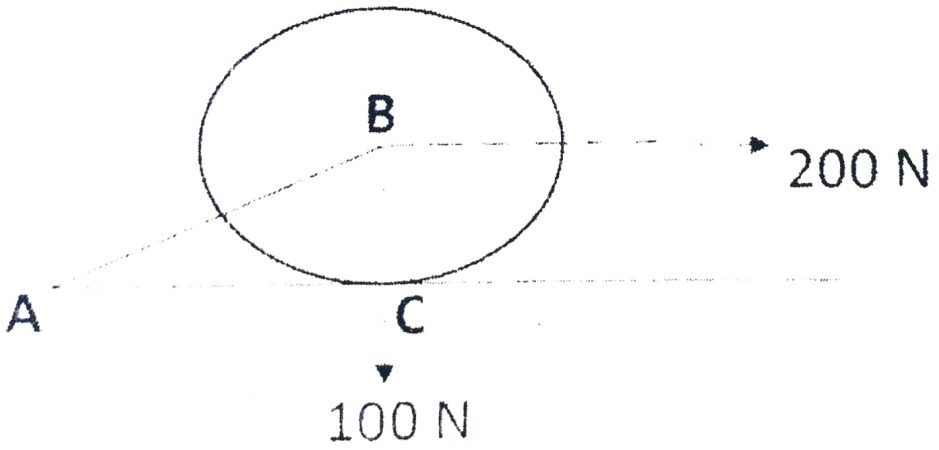
7. (a) Derive Euler's equation of motion of a rigid body. 8

(b) Define moment of inertia. What is its physical significance ? 7

UNIT – IV

8. (a) What do you mean by equilibrium ? What are their types ? And what are conditions of equilibrium in three and two dimensions. 7

(b) A circular roller of radius 5 cm and weight 100 N rest on a smooth horizontal surface and is hold by an incline bar AB of length 10 cm as shown in fig. a horizontal force of 200 N is acting at B. Using free body diagram find the tension in the bar AB and vertical reaction at C. 8



9. Find out the force in the member of the truss having each side equal to 3m loaded and supported as shown in fig. below : 15

AB = BC = CD = DE = BE = BD = 3 m