

Roll No. ....

**3004**

**B. Tech. 1st Semester (Civil Engineering)  
Examination – March, 2021**

**MECHANICS**

**Paper : BSC-PHY-104-G**

*Time : Three Hours ]*

*[ Maximum Marks : 75*

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*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.*

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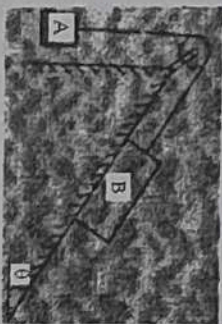
*Note :* Attempt *five* questions in all. All questions carry equal marks.

1. (i) Distinguish between Inertial and Fictitious forces. 3
- (ii) What do you understand by free, forced and resonant oscillator ? 3
- (iii) Define rigid body. How many coordinates are required to specify its configuration ? 3
- (iv) What is inverse square law ? Give some examples. 3

- (v) What are free body diagrams ? Explain with an example. 3
2. Derive relations between Plane polar coordinates and Cartesian coordinates. 15
3. (a) What is a conservative force ? How is it related to the potential energy ? 8  
 (b) Describe the invariance of Newton's Laws of Motion. 7
4. What are equipotential surfaces ? What is the magnitude of the gradient of potential given by  $U = x^2 + y^2 + z^2 + xy + xz$  at point (1, 1, 2). 15
5. What is coriolis force ? Prove that it owes its existence to motion of a particle with respect to a rotating frame of reference. 15
6. Discuss Angular Momentum of a system of particles. Establish a relationship between Torque and Angular Acceleration. 15
7. Find an expression for moment of inertia of a rod about an axis passing through the centre of the rod and perpendicular to it. 15

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8. Knowing that  $W_a = 25 \text{ N}$  and  $\theta = 30^\circ$ . Determine :  
 (a) The smallest value of  $W_b$  for which the system is in equilibrium.  
 (b) Largest value of  $W_b$  for which system is in equilibrium. take  $\mu_s = 0.35$  and  $\mu_k = 0.25$ . 15



9. (a) What is angle of friction and angle of repose ? 8  
 (b) Discuss the Coulomb's Law of dry friction. 7

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