Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Winter 2018 - 19 Examination

Semester: 1 **Date: 11/12/2018**
Subject Code: 203192103 **Time: 2:00pm to 04:30pm**
Subject Name: Engineering Physics **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions. (All are compulsory) **(15)**

1. What is the unit of Fictitious force?
   a) Newton b) Pascal
   c) Bar d) unit less

2. Which of the following equation gives r_{max}?

   a) $\frac{L^2}{m\alpha(1-\varepsilon)}$ b) $\frac{L^2}{m\alpha(1+\varepsilon)}$
   c) $\frac{L^2}{m\alpha}$ d) $\frac{k}{(1-\varepsilon)}$

3. Which of the following gives the equation for static friction?
   a) μ_s b) $\mu_s \eta$
   c) μ_s N d) $\mu_s T$

4. How many degrees of freedom are required to define a Rigid body?
   a) 5 b) 6
   c) 3 d) 0

5. If the total momentum of the body is zero then, the angular momentum with respect to its center of mass is _____.
   a) m x a b) infinite
   c) 0 d) π

6. A force that points radially and whose magnitude only depends on the distance from the source is known as _____ (center of mass / central force)

7. In order to be in an inertial frame of reference the sum of total forces must be equal to _____.

8. If $\tau = 0$, then L = constant. **True or False**
9. Vector addition is commutative. **True or False**
10. The value of eccentricity of Parabola is equal to zero. **True or False**
11. Define Centripetal Acceleration.
12. Define Rigid Body.
13. State any two example of Central Force.
14. Define Inertial frame of reference.
15. Define Moment of Inertia.

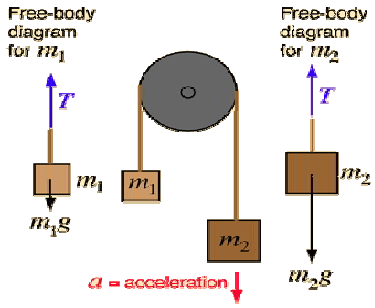
Q.2 Answer the following questions. (Attempt any three) **(15)**

A) Explain Galilean transformation and prove that newton's 2nd law of motion is invariant under Galilean transformation.

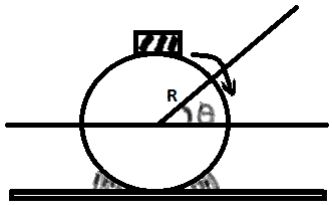
B) Write a note on Harmonic Oscillator.

C) Derive the Euler's equation of motion using rigid body Dynamics.

D) Using Atwood's Machine, calculate the motion of mass m_1 and m_2 with their acceleration.



Q.3 **A)** A Block of mass *m* is sliding from a drum which is fixed on a surface. The block starts to fall from the top of the drum. At what angle (θ) the block will fly off the drum? **(07)**



B) 1) Derive the equation of Effective potential ($V_{eff}(r)$) and Effective force ($F_{eff}(r)$) using Lagrangian Formulation. **(06)**

2) What is the equation obtained for ellipse when angle between origin and bob is 90° in a Foucault pendulum? **(02)**

OR

B) 1) Mention the properties of Central force and also prove that angular momentum is conserved when the particle is subjected to a central force. **(05)**

2) Calculate the moment of Inertia for the solid disc of mass M and radius R about an axis passing through its center. **(03)**

Q.4 **A)** A wire is rotating with an angular speed ω in a plane. A bead is placed at a distance r_0 from center with respect to which the wire is rotated. Calculate the change in position of the bead w.r.t time and velocity of the bead w.r.t time. What will be the force applied by the bead on the wire? **(07)**

OR

A) Derive the expression for five term acceleration formula using plane polar coordinates. **(07)**

B) Write a brief note about the conic orbits. Also obtain the equations for their major and minor axis with proof. **(08)**