PARUL UNIVERSITY

## FACULTY OF ENGINEERING \& TECHNOLOGY <br> B.Tech.Summer 2018-19 Examination

## Semester: 1

Date:16/05/2019
Subject Code: 203192103
Time: 02:00pm 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)
5. What will be the vector displacement of a person if he walks 300 m east and 400 m north?
a) 700 m
b) 2500 m
c) 500 m
d) 100 m
6. Which of the following equation gives $\mathrm{r}_{\text {max }}$ ?
a) $\frac{L^{2}}{m \alpha(1-\varepsilon)}$
b) $\frac{L^{2}}{m \alpha(1+\varepsilon)}$
c) $\frac{L^{2}}{m \alpha}$
d) $\frac{k}{(1-\varepsilon)}$
7. Which of the following gives the equation for static friction?
a) $\mu_{S}$
b) $\mu_{s} \eta$
c) $\mu_{s} \mathrm{~N}$
d) $\mu_{S} T$
8. How many degrees of freedom are required to define a Rigid body?
a) 5
b) 6
c) 3
d) 0
9. If the total momentum of the body is zero then, the angular momentum with respect to its center of mass is $\qquad$ .
a) $m x a$
b) infinite
c) 0
d) $\pi$
10. A force that points radially and whose magnitude only depends on the distance from the source is known as $\qquad$ (center of mass / central force)
11. In order to be in an inertial frame of reference the sum of total forces must be equal to
$\qquad$
12. If $\tau=1$, then $L=$ constant. True or False
13. Vector addition is cumulative. True or False
14. The value of eccentricity of Parabola is equal to one. True or False
15. Define conservative forces.
16. State newton's law of motion.
17. State any two example of Central Force.
18. Define Inertial frame of reference.
19. Define Fictitious Force
Q. 2 Answer the following questions. (Attempt any three)
A) Under vector transformation which of the following vectors are equal: i) from $(2,3,-1)$ to $(2,4,0)$ ii) from $(5,4,2)$ to $(5,5,3)$ iii) from $(1,1,0)$ to $(5,6,1)$ iv) from $(1,1,0)$ to $(2,3,-5)$.
B) Using Gravitational Potential, derive the expression for Eccentricity.
C) Derive the Euler's equation of motion using rigid body Dynamics.
D) Using Atwood's Machine, calculate the motion of mass $\mathrm{m}_{1}$ and $\mathrm{m}_{2}$ 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 ( $\theta$ ) the block will fly off the drum?

B) 1) Derive the equation of Effective potential $\left(\mathrm{V}_{\text {eff }}(\mathrm{r})\right.$ ) and Effective force $\left(\mathrm{F}_{\text {eff }}(\mathrm{r})\right.$ ) using Lagrangian Formulation.
2) What is the equation obtained for ellipse when angle between origin and bob is $90^{\circ}$ in s Foucault pendulum?

## OR

B) 1) Prove: If a particle is subjected to a central force then its angular momentum is conserved.
2) Calculate Gradient, Divergence \& Curl of $F=6 x^{2} \hat{\imath}+5 y z^{3} \hat{\jmath}-4 x^{3} y^{2} z k^{\wedge}$ at $(2,2,2)$.
Q. 4 A) A particle of mass $m$ is placed on a frictionless table which moves in a circular direction on the table. The particle is connected with a thread which passes through a hole at center of the table which is pulled in downward direction at constant speed. Calculate how position and velocity changes with respect to time. Also calculate the force required to pull the thread down.

## OR

A) Derive the expression for five term acceleration formula using plane polar coordinates.
B) Write a brief note about the conic orbits. Also obtain the equations for their major and minor axis with proof.

