

Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, January 2021

Course: Mechanics	Semester: I
Program: BSc. (H) Physics	Time 03 hrs.
Course Code: PHYS 1012	Max. Marks: 100

SECTION A

- 1. Each Question will carry 5 Marks**
- 2. Instruction: Write the statement / Select the correct answer(s)**

S. No.	Question	CO
Q 1	Which of the following are not true about impulse? a. Impulse is a vector quantity b. The direction of impulse is parallel to force c. Impulse is zero when initial and final momenta are same d. Short interaction time means small damage e. Impulse is area under the momentum-time curve	CO1
Q2	The ratio of gravitational potential of a solid sphere at centre and circumference is a. 0.5 : 1 b. 1 : 1 c. 1.5 : 1 d. 2 : 1	CO3
Q3	The moment of inertia of a thin rod of mass M and length L, about an axis passing through a point L/4 from one end and perpendicular to length is a. $\frac{7}{48}ML^2$ b. $\frac{1}{3}ML^2$ c. $\frac{1}{4}ML^2$ d. ML^2	CO1
Q4	The coefficient of viscosity of liquid is equal to the external force that acts between two successive layers of unit cross-sectional area of fluid to a. balance internal frictional force between layers b. maintain unit velocity gradient between layers c. maintain the motion of liquid between layers	CO2
Q5	What is a satellite? State the difference between geostationary and geosynchronous satellites in not more than 100 words.	CO1
Q6	If two particles of masses m and 2m are separated by a distance r, then the reduced mass is: a. $m\sqrt{2r}$ b. $\frac{3m}{2}$ c. $\frac{2m}{3}$ d. m	CO1

SECTION B

1. Each question will carry 10 marks
2. Instruction: Write short / brief notes

Q 7	Discuss Michelson-Morley Experiment with appropriate diagram. Analyse the findings of this famous experiment?	CO4
Q 8	Define angular momentum and explain with the help of examples the principle of conservation of angular momentum. Prove that the torque acting on a rotating body is equal to the rate of change of angular momentum.	CO2
Q 9	Write short notes on any two of the following: (a) Length Contraction (b) Time Dilation (c) Twin Paradox (d) Global positioning system	CO2
Q 10	(a) A wire 3 m long and 0.625 cm^2 in cross-section is found to stretch 3 mm under a tension of 1200 kg. What is the Young's modulus of the material of the wire? (b) A simple harmonic motion is represented by the equation $y = 10 \sin(10t - \frac{\pi}{6}),$ Calculate (i) maximum velocity and (ii) maximum acceleration	CO3
Q 11	State the fundamental postulates of special theory of relativity and deduce from them the Lorentz transformations and show how these are superior to Galilean Transformations. OR What are non-inertial reference frames? Explain how laws of Physics change in such frames. Give examples of Coriolis forces.	CO2
Section C		
<ol style="list-style-type: none">1. Each Question carries 20 Marks.2. Instruction: Write long answers.		
Q12	With the help of appropriate diagram, deduce an expression for the distribution of velocity of a liquid flowing through a uniform capillary of circular cross section. Show that it represents a parabola. Also derive Poiseuille's formula. OR Explain damped vibrations and forced vibrations citing an example of each. Establish and solve the differential equation of a damped harmonic oscillator discussing the three cases along with amplitude versus time graphs.	CO4