No. of Printed Pages/Questions:3/12

O.P.JINDAL SCHOOL, SAVITRI NAGAR
PERIODIC TEST –III (Round-2) **(2025-26)**

CLASS-XI **MAX.MARKS-20**

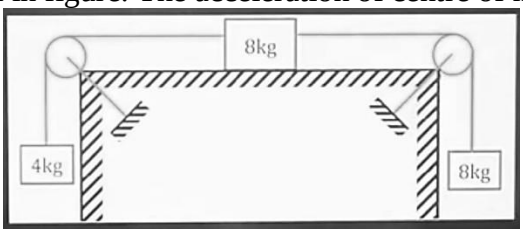
SUBJECT-PHYSICS **MAX.TIME-1 Hour**

General Instruction:-
(i)All questions are compulsory .There are 12 questions in this question paper with internal choice.
(ii) SECTION –A: Question numbers 1 to 6 are MCQs , carrying 1 mark each.
(iii) SECTION –B: Question numbers 7 to 10 are short answer questions carrying 2 marks each.
(iv) SECTION –C: Question numbers 11 and 12 are long questions carrying 3marks each.
(v)There will be internal choices in some of the question of section B and section C.

SECTION A

Q1. Find the torque of a force $(5\,i - 2j + 7k)$ about the origin, which acts on a particle whose position vector is $(2i - j + k)$.
(a) $-5i+9j+k$ (b) $-5i-9j+k$
(c) $-5i-9j-k$ (d) $5i-9j+k$

Q2. For the system shown in figure. The acceleration of centre of mass is (Take g = 10 m/s²)



(a) $-0.4j-0.8i$ (b) $-0.4j+0.8i$
(c) $-0.8j+0.4i$ (d) $0.4j-0.8i$

Q3. Two balls A and B having mass 1 kg and 2 kg, moving with speed 21 m/s and 4 m/s respectively in opposite direction, collide head on. After collision A moves with a speed of 1 m/s in the same direction, then the coefficient of restitution is:
(a)0.1 (b)0.2
(c)0.3 (d)0.4

Q4. At what depth below the surface of earth , acceleration due to gravity 'g' will be half its value 1600 km above the surface of the earth.
(a)4.2×10^6 m (b)3.91×10^6 m
(c)1.59×10^6 m (d)2.25×10^6 m

Q5. The gravitational field due to a mass distribution is $E = \frac{K}{x^3}$ in the x-direction. (K is a constant). Taking the gravitational potential to be zero at infinity, its value at a distance x is

(a) $\frac{K}{x}$ (b) $\frac{K}{2x}$

(c) $\frac{K}{x^2}$ (d) $\frac{K}{2x^2}$

Q6. What is the ratio of the escape velocity V_e to the orbital velocity V_o for a satellite orbiting close to the surface of a planet?

(a)$\sqrt{2}$: 1 (b)2

(c)1:$\sqrt{2}$ (d)1:2

SECTION B

Q7. Attempt either **(A)** or **(B):**

(A)

If earth suddenly shrinks to $\frac{1}{64}^{th}$ of its initial volume, then find the new time period for the Earth.

OR

(B):

A satellite is revolving round the earth at a height of 600 km.

Find (i) the speed of the satellite and

(ii) the time period of the satellite.

Radius of the earth = 6400 km and mass of the earth = 6 x 10^{24}kg.

Q8. A rod of mass 10 kg and length 8 m is rotating with an angular velocity of 4 rad/sec. The rod is hinged 2 m from one of its ends, and the axis of rotation passes perpendicular to the plane containing the rod. Calculate the kinetic energy of the rod about its axis of rotation.

OR

The time period of a satellite of earth is 8 hours. If the separation between the Earth and the satellite is increased to two times the previous value, find the new time period of the satellite.

Q9. Three point masses are placed at the corners of an equilateral triangle of side length 4 m. The masses are 2 kg, 3 kg, and 5 kg at corners A, B, and C respectively. Find the coordinates of the center of mass of the system, taking corner A as the origin and side AB along the x-axis.

Q10. How much above the surface of earth does the acceleration due to gravity reduces by 64% of its value on the surface of Earth.

SECTION C

Q11.Attempt either **(A)** or **(B):**

(A):

Derive the expression for the Moment of inertia of a solid sphere of mass M kg and radius R uniformly distributed throughout its volume about an axis passing through its centre of mass and perpendicular to the plane.

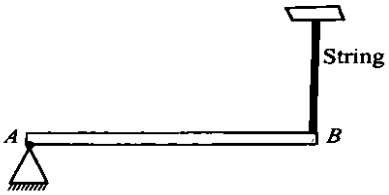
OR

(B):

(i) Calculate gravitational field intensity on the axis of a ring of mass M and radius R at x distance from its centre if Gravitational potential at that point is $\frac{-GM}{\sqrt{R^2+x^2}}$.

(ii)find where will be the gravitational field intensity on the axis of a ring be maximum.
(iii)Find maximum value of gravitational field intensity at its axis.

Q12. A uniform rod AB of mass 2 kg is hinged at one end A. The rod is kept in the horizontal position by a massless string tied to point B. Find the reaction of the hinge (in N) on end A of the rod at the instant when string is cut. ($g = 10\ m/s^2$)



OR

State and prove Kepler's second law of planetary motion.

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