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பதிவு எண்
Register Number

PART – III
இயற்பியல் / PHYSICS
(ஆங்கில வழி / **Tamil & English Version**)

Time Allowed : 3.00 Hours] [Maximum Marks : 70

Instructions : (1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

(2) Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams.

PART – I

Note : (i) Answer **all** the questions. **15x1=15**

(ii) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

1. If $\pi = 3.14$, then the value of π^2 is

(a) 9.8596 (b) 9.860 (c) 9.86 (d) 9.9

2. If the force is proportional to square of velocity, then the dimension of proportionality constant is

(a) $[MLT^0]$ (b) $[MLT^{-1}]$ (c) $[ML^{-2}T]$ (d) $[ML^{-1}T^0]$

3. 1^0 is equal to ---------- radian.

(a) 1.744×10^{-2} rad (b) 1.744×10^{2} rad

(c) 1.44×10^{-2} rad (d) 1.44×10^{2} rad

4. If one object is dropped vertically downward and another object is thrown horizontally from the same height, then the ratio of vertical distance covered by both objects at any instant t is

(a) 1 (b) 2 (c) 4 (d) 0.5

5. An object is dropped in an unknown planet from height 50 m, it reaches the ground in 2 s. The acceleration due to gravity in this unknown planet is

(a) $g = 20\ m\ s^{-2}$ (b) $g = 25\ m\ s^{-2}$ (c) $g = 15\ m\ s^{-2}$ (d) $g = 30\ m\ s^{-2}$

6. Two masses m_1 and m_2 are experiencing the same force where $m_1 < m_2$. The ratio of their acceleration $\frac{a_1}{a_2}$ is

(a) 1 (b) less than 1

(c) greater than 1 (d) all the three cases

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7. An object of mass m begins to move on the plane inclined at an angle θ. The coefficient of static friction of inclined surface is μ_s. The maximum static friction experienced by the mass is

(a) mg (b) $\mu_s$mg (c) $\mu_s$mg sinθ (d) $\mu_s$mg cos θ

8. The potential energy of a system increases, if work is done

(a) by the system against a conservative force

(b) by the system against a non-conservative force

(c) upon the system by a conservative force

(d) upon the system by a non-conservative force

9. Two equal masses m_1 and m_2 are moving along the same straight line with velocities 5 ms^{-1} and -9 ms^{-1} respectively. If the collision is elastic, then calculate the velocities after the collision of m_1 and m_2, respectively

(a) -4 ms^{-1} and 10 ms^{-1} (b) 10 ms^{-1} and 0 ms^{-1}

(c) -9 ms^{-1} and 5 ms^{-1} (d) 5 ms^{-1} and 1 ms^{-1}

10. A couple produces,

(a) pure rotation (b) pure translation

(c) rotation and translation (d) no motion

11. The speed of a solid sphere after rolling down from rest without sliding on an inclined plane of vertical height h is,

(a) $\sqrt{\frac{4}{3}gh}$ (b) $\sqrt{\frac{10}{7}gh}$ (c) $\sqrt{2gh}$ (d) $\sqrt{\frac{1}{2}gh}$

12. The time period of a satellite orbiting Earth in a circular orbit is independent of

(a) Radius of the orbit (b) The mass of the satellite

(c) Both the mass and radius of the orbit

(d) Neither the mass nor the radius of its orbit

13. The kinetic energy of the satellite orbiting around the Earth is

(a) equal to potential energy (b) less than potential energy

(c) greater than kinetic energy (d) zero

14. If the external torque acting on the body is zero, the component of angular momentum along the axis of rotation is

(a) zero (b) constant (c) 1 (d) ½

15. The relation between momentum and kinetic energy is

(a) p = $\sqrt{2m\,(KE)}$ (b) p = $\sqrt{KE}$ (c) p = $\sqrt{2\ mgh}$ (d) p = $\sqrt{2m}$

PART – II

Note : Answer **any six** questions. Question No. **18** is **compulsory**. **6x2=12**

16. How will you measure the diameter of the Moon using parallax method?
17. How do you deduce that two vectors are perpendicular?
18. If a stone of mass 0.25 kg tied to a string executes uniform circular motion with a speed of 2 ms^{-1} of radius 3 m, what is the magnitude of tensional force acting on the stone?
19. State Newton's Universal law of gravitation.
20. What is the difference between sliding and slipping?
21. Define gravitational potential.
22. Define Power. Give its unit.
23. What is the significance of moment of inertia?
24. What is the meaning by pseudo force?

PART – III

Note : Answer **any six** questions. Question No. **28** is **compulsory**. **6x3=18**

25. State the rules for rounding off.
26. State Newton's three laws.
27. Write the differences between conservative and Non-conservative forces.
28. A weight lifter lifts a mass of 250 kg with a force 5000 N to the height of 5 m.
    (a) What is the work done by the weight lifter?
    (b) What is the work done by the gravity?
    (c) What is the net work done on the object?
29. Explain in detail the geostationary and polar satellites.
30. Derive the equation for work done by torque.
31. Discuss the properties of scalar product.
32. Using free body diagram, show that it is easy to pull an object than to push it.
33. Compare the kinetic equations for linear motion and kinematic equations for angular motion.

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PART – IV

Note : Answer **all** the questions. **5x5=25**

34. (a) Derive the expression for moment of inertia of a rod about its centre and perpendicular to the rod.

OR

(b) Explain in detail the various types of errors.

35. (a) Derive the expression for centripetal acceleration of a particle in uniform circular motion.

OR

(b) State and prove Work – Energy theorem.

36. (a) Derive the equation for escape velocity.

OR

(b) Show that in an inclined plane, angle of friction is equal to angle of repose.

37. (a) (i) What are the uses of dimensional analysis.

(ii) Check the correctness of the equation $\frac{1}{2} mv^2 = mgh$ using dimensional analysis method.

OR

(b) Arrive at an expression for elastic collision in one dimension and discuss various cases.

38. (a) Obtain an expression for kinetic energy in rotation. Give the relation between rotational kinetic energy and angular momentum.

OR

(b) Explain the variation of g with altitude.

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