COMMON QUARTERLY EXAMINATION - 2024

* Standard XI Reg.No. [ ][ ][ ][ ][ ][ ]

PHYSICS

Time : 3.00 hrs Part - I *Marks : 70*

I. Choose the correct answer: 15 x 1 = 15

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. The dimensional formula of Planck's constant h is
   a) $[ML^2T^{-1}]$ b) $[ML^2T^{-3}]$
   c) $[MLT^{-1}]$ d) $[ML^3T^{-3}]$
3. The dimension of $(\mu_0 c_0)^{1/2}$ is
   a) length b) time
   c) velocity d) force
4. Identify the unit vector in the following
   a) $\hat{i}+\hat{j}$ b) $\frac{\hat{i}}{\sqrt{2}}$ c) $\hat{k}-\frac{\hat{j}}{\sqrt{2}}$ d) $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$
5. If a particle has negative velocity and negative acceleration, its speed
   a) increases b) decreases
   c) remains same d) zero
6. If an object is dropped from the top of a building and it reaches the ground at t = 4s, then the height of the building is (ignoring the air resistance) ($g = 9.8\ ms^{-2}$)
   a) 77.3 m b) 78.4 m c) 80.5 m d) 79.2 m
7. 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

8. Force acting on the particle moving with constant speed is
   a) always zero b) need not be zero
   c) always non zero d) cannot be concluded

9. The centrifugal force appears to exist
   a) only in inertial frames b) only in rotating frames
   c) in any accelerated frames d) both in inertial and non-inertial frames

10. The work done by the conservative force for a closed path is
    a) always negative b) zero
    c) always positive d) not defined

11. If the potential energy of the particle is $\alpha - \frac{\beta}{2}x^2$, then force experienced by the particle is
    a) $F = \frac{\beta}{2}x^2$ b) $F = \beta x$ c) $F = -\beta x$ d) $F = \frac{-\beta}{2}x^2$

12. A spring of force constant k is cut into two pieces such that one piece is double the length of the other, then the long piece will have a force constant of
    a) $\frac{2}{3}k$ b) $\frac{3}{2}k$ c) 3k d) 6k

13. A couple produces
    a) pure rotation b) pure translation
    c) rotation and translation d) no motion

14. A rigid body rotates with an angular momentum L. If its kinetic energy is halved, the angular momentum becomes
    a) L b) $L/2$ c) 2L d) $L/\sqrt{2}$

15. 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) $\sqrt{\frac{1}{2}gh}$

Part - II

II. Answer any 6 questions. (Q.No.24 is compulsory) **6 x 2 = 12**

16. Write the applications of dimensional analysis. 32
17. Define a radian. 11
18. What is non-uniform circular motion? 92
19. A RADAR signal is beamed towards a planet and its echo is received 7 minutes later. If the distance between the planet and the earth is 6.3×10^{10} m. Calculate the speed of the signal ? 15 (eg. 1.3) $V = \frac{2d}{t} = 3 \times 10^8$ m/s
20. Define impulsive force. 65 (En) 133
21. Define coefficient of restitution. 200
22. What is radius of gyration? 237
23. Give any two examples of torque in day-to-day life. 217, 218
24. Calculate the energy consumed in electrical units when a 75 W fan is used for 8 hours daily for one month. (30 days) 191 (eg 4.18)

Part - III

III. Answer any 6 questions. (Q.No.33 is compulsory) **6 x 3 = 18**

25. How will you measure the diameter of the moon using parallax method? 14
26. Derive the relation between linear velocity and angular velocity. 90 (Change last eqn AB = mc x θ)
27. Explain various types of friction. Suggest a few methods to reduce friction. 136, 145
28. Arrive at an expression for power and velocity. 192
29. Consider a circular road of radius 20 meter banked at an angle of 15 degree. With what speed a car has to move on the turn so that it will have safe turn? 153 (eg. 3.25) $V = \sqrt{rg\tan\theta} = 7.1$ m/s
30. Write the difference between conservative and non-conservative forces. Give two examples each. 182
31. State and explain conservation of angular momentum. 247
32. Explain the types of equilibrium with suitable examples. (Any 3) 228
33. Two vectors are given as $\vec{r} = 2\hat{i} + 3\hat{j} + 5\hat{k}$ and $\vec{F} = 3\hat{i} - 2\hat{j} + 4\hat{k}$. Find the resultant vector $\vec{\tau} = \vec{r} \times \vec{F}$. 57 (eg 2.9)

$$\vec{\tau} = \vec{r} \times \vec{F} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 3 & 5 \\ 3 & -2 & 4 \end{vmatrix} = (12 - (-10))\hat{i} - (8 - 15)\hat{j} + (-4 - 9)\hat{k}$$

$$= 22\hat{i} + 7\hat{j} - 13\hat{k}$$

Part - IV

IV. Answer all the questions. 5 x 5 = 25

34. a) Write the rules for determining significant figures. 28

(OR)

b) Derive the expression for moment of inertia of a rod about its centre and perpendicular to the rod. 234, 235

35. a) Discuss the properties of scalar products. 53

(OR)

b) Arrive at an expression for elastic collision in one dimension and discuss various cases. 194, 195, 196

36. a) Explain the motion of blocks connected by a string in vertical motion. 126

(OR)

b) Derive the equation of motion, range and maximum height reached by the particle thrown at an oblique angle θ with respect to the horizontal direction. 84, 85

37. a) State and explain work energy principle. Mention any three examples for it. 174

(OR)

b) Convert 76 cm of mercury pressure into Nm^{-2} using the method of dimensions. 32 kg·1 (1·12)

38. a) State and prove parallel axis theorem. 239

(OR)

b) Derive an expression for particle moving in an inclined plane. 122

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