

Y-23-Z

Roll No.

Total No. of Questions : 26]

[Total No. of Printed Pages : 7

XIARJKUT23

9223-Z

PHYSICS

Time : 3 Hours]

[Maximum Marks : 70

Section-A

(Very Very Short Answer Type Questions)

1 each

1. If $x = a \sin \theta$, $y = b \cos \theta$, find $\frac{dy}{dx}$.
2. Can a force change only the direction of velocity without changing its magnitude ? If yes, name the situation.
3. Define Plane progressive wave.
4. What are free Oscillations ?
5. What do you mean by a thermodynamical reversible process ?

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Turn Over

Section-B

(Very Short Answer Type Questions)

2 each

6. What are the dimensions of a & b in the relation :

$$E = \frac{b - x^2}{at},$$

where E , x , t represent energy, distance and time respectively.

Or

Find the percentage error in the area of a rectangular field of length

(200 ± 5) m & breadth (50 ± 2) m.

7. Derive relation between torque and angular momentum.
8. Define stress and strain.
9. State zeroth law of thermodynamics. Hence define temperature.
10. The moment of inertia of a hollow sphere about its diameter is $\frac{2}{3}MR^2$.

What is its radius of gyration about that axis.

Section-C

(Short Answer Type Questions)

3 each

11. Define angle of repose. Show that coefficient of friction is equal to the tangent of angle of repose.

Or

Define centripetal force. Derive expression for it.

12. Differentiate 'sin x ' by ab-initio method.
13. An experiment measures quantities a , b , c and x as $x = ab^2c^{-3}$. The percentage error in a , b , c are $\pm 1\%$, $\pm 3\%$ and $\pm 2\%$ respectively. Find the percentage error in (X).
14. State Newton's *three* laws of motion. Show that Newton's second law is the only real law of motion.

15. Define elastic, inelastic collision, coefficient of restitution. How does coefficient of restitution define elastic and inelastic collision.
16. Define work, power and energy. Give their S.I. units.
17. Write six postulates of kinetic theory of gases.
18. State law of equipartition of energy. Write the number of degrees of freedom of monoatomic, diatomic and triatomic gas.
19. Derive an expression for displacement of a plane progressive wave.
20. State and explain Kepler's three laws of planetary motion.
21. The escape speed of the earth is 11.2 km/s. Find the escape speed of another planet of mass 100 times and radius 10 times that of earth.
22. A refrigerator is to remove heat from the eatables kept inside at 9°C and if room temperature is 36°C , calculate the coefficient of performance.

Section-D

(Value Based Questions)

4

23. A man arrived at Delhi Railway Station and wanted to go to his relative's

house 10 km away from the station. He hired a taxi to reach the destination.

The driver followed a long path 25 km to reach the destination in one hour

and charged for 25 km from the man. Now, answer the following :

- (i) Comment on the behaviour of driver.
- (ii) Calculate the average speed of the taxi.
- (iii) Calculate the average velocity of the taxi.

Section-E**(Long Answer Type Questions)****5 each**

24. Derive :

(i) $v = u + at$

(ii) $s = ut + \frac{1}{2}at^2$

where letters have their usual meanings (Use calculus approach).

Or

Find an expression for the maximum height, time of flight and horizontal range of a projectile fired at an angle with the horizontal.

25. Define Capillarity. Find an expression for the height of liquid due to its rise in a capillary tube.

Or

What are various modes of transfer of heat ? Discuss them in detail.

26. Derive an expression for the displacement, velocity and acceleration of a particle executing simple Harmonic motion.

Or

What is Doppler effect ? Derive an expression for the general apparent frequency of sound in doppler effect. Hence find expression for apparent frequency when source is at rest and observer is in motion.