

M2022

No. of Printed Pages : 4

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B**PART – III**, awgpayi / **PHYSICS**
(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. A transverse wave moves from a medium A to a medium B. In medium A, the velocity of the transverse wave is 500 ms^{-1} and the wavelength is 5 m. The frequency and the wavelength of the wave in medium B when its velocity is 600 ms^{-1} , respectively are
 - (a) 120 Hz and 6 m
 - (b) 120 Hz and 5 m
 - (c) 100 Hz and 6 m
 - (d) 100 Hz and 5 m
2. When a car takes a sudden left turn in the curved road, passengers are pushed towards the right due to
 - (a) inertia of rest
 - (b) inertia of direction
 - (c) absence of inertia
 - (d) inertia of motion
3. 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) -9 ms^{-1} and 5 ms^{-1}
 - (b) -4 ms^{-1} and 10 ms^{-1}
 - (c) 5 ms^{-1} and 1 ms^{-1}
 - (d) 10 ms^{-1} and 0 ms^{-1}
4. Two objects are projected at angles 30° and 60° respectively with respect to the horizontal direction. The ranges of two objects are denoted as R_{30° and R_{60° . Choose the correct relation from the following
 - (a) $R_{30^\circ} = \frac{R_{60^\circ}}{2}$
 - (b) $R_{30^\circ} = R_{60^\circ}$
 - (c) $R_{30^\circ} = 2R_{60^\circ}$
 - (d) $R_{30^\circ} = 4R_{60^\circ}$
5. The dimensional formula strain:
 - (a) $\text{ML}^{-2}\text{T}^{-1}$
 - (b) $\text{M}^0\text{L}^0\text{T}^0$
 - (c) $\text{ML}^{-1}\text{T}^{-2}$
 - (d) M^0LT^0

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6. The efficiency of a heat engine working between the freezing point and boiling point of water is
 (a) 26.8% (b) 6.25% (c) 12.5% (d) 20%
7. Which of the following is not a scalar?
 (a) pressure (b) viscosity (c) stress (d) surface tension
8. If a particle executes uniform circular motion in the xy plane in clock wise direction, then the angular velocity is in
 (a) -z direction (b) +y direction (c) -x direction (d) +z direction
9. The ratio $\gamma = \frac{C_p}{C_v}$ for a gas mixture consisting of 8 g of helium and 16 g of oxygen is
 (a) 27/17 (b) 23/15 (c) 17/27 (d) 15/23
10. 1 kilowatt hour (1 kWh) is:
 (a) 36×10^5 J (b) 36×10^5 WS (c) 3.6×10^6 J (d) All the above
11. A simple pendulum is suspended from the roof of a school bus which moves in a horizontal direction with an acceleration a, then the time period is
 (a) $T \propto \sqrt{g^2 + a^2}$ (b) $T \propto \frac{1}{g^2 + a^2}$
 (c) $T \propto (g^2 + a^2)$ (d) $T \propto \frac{1}{\sqrt{g^2 + a^2}}$
12. A couple produces,
 (a) rotation and translation (b) pure rotation
 (c) no motion (d) pure translation
13. If the mass and radius of the Earth are both doubled, then the acceleration due to gravity g'
 (a) 2 g (b) remain s same
 (c) 4 g (d) $\frac{g}{2}$
14. If $\pi = 3.14$, then the value of π^2 is
 (a) 9.86 (b) 9.8596 (c) 9.9 (d) 9.860
15. If the acceleration due to gravity becomes 4 times its original value, then escape speed
 (a) becomes halved (b) remains same
 (c) 4 times of original value (d) 2 times of original value

PART – II**Note :** Answer **any six** questions. Question No. **24** is **compulsory**.**6x2=12**

16. What is Reynold's number?
17. Define the term 'degrees of freedom'.
18. In a submarine equipped with sonar, the time delay between the generation of a pulse and its echo after reflection from an enemy submarine is observed to be 80 s. If the speed of sound in water is 1460 ms^{-1} , what is the distance of enemy submarine?
19. State Wien's Displacement Law.
20. Define - gravitational potential.
21. What is simple harmonic motion?
22. State Newton's second law.
23. State conservation of angular momentum.
24. A particle moves along the x-axis in such a way that its coordinates x varies with time 't' according to equation $x=2-5t+6t^2$. What is the initial velocity of the particle?

PART – III**Note :** Answer **any six** questions. Question No. **33** is **compulsory**.**6x3=18**

25. Compare Elastic and Inelastic collision.
26. Discuss the Law of Transverse Vibrations in stretched strings.
27. Using free body diagram, show that whether it is easy to pull an object than to push it.
28. What are the resultants of the vector product of two vectors given by $\vec{A} = 4\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{B} = 5\hat{i} + 3\hat{j} - 4\hat{k}$?
29. Write a short note on polar satellites.
30. Give any three applications of viscosity.
31. Define torque. Give any two examples of torque in day-to-day life.
32. What is meant by periodic and non-periodic motion? Give any two examples, for each motion.
33. A person does 30 kJ work on 2 kg of water by stirring using a paddle wheel. While stirring, around 5 kcal of heat is released from water through its container to the surface and surroundings by thermal conduction and radiation. What is the change in internal energy of the system?

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PART – IV

Note : Answer **all** the questions.

5x5=25

34. (a) (i) Write the applications of the Dimensional Analysis.
(ii) Check the correctness of the equation $\frac{1}{2}mv^2 = mgh$ using dimensional analysis method.

(OR)

- (b) Obtain an expression for the surface tension of a liquid by capillary rise method.

35. (a) State and explain equipartition of energy.

(OR)

- (b) Derive the kinematic equations of motion for constant acceleration.

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

(OR)

- (b) Explain the variation of acceleration due to gravity (g) with altitude.

37. (a) Explain the horizontal oscillations of a spring.

(OR)

- (b) State and explain work-kinetic energy theorem. Discuss the inferences of work-kinetic energy theorem.

38. (a) Discuss rolling on inclined plane and arrive at the expression for the acceleration.

(OR)

- (b) Explain how overtones are produced in a closed organ pipe.

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