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RANCHI REGION

SESSION ENDING EXAMINATION 2018 - 19

CLASS - XI

MARKS : 70

SUBJECT : PHYSICS

TIME : 3 HOURS

General Instructions :-

1. All questions are compulsory. There are 27 questions in all.
2. This question paper has four sections: Section A, Section B, Section C, and Section D.
3. Section A contains five questions of one mark each, Section B contains seven questions of two marks each, Section C contains twelve questions of three marks each and Section D contains three questions of five marks each.
4. There is no overall choice. However, an internal choice has been provided in two questions of one mark, two questions of two marks, four questions of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.
5. Use of calculator or other electronic gadgets are restricted, you may use log table.

SECTION - A

1. Who was awarded Nobel prize for Photo electric effect?

2. What does the speedometer record?

OR

Action and reaction are equal and opposite. Why cannot they cancel each other?

3. Mention the physical quantities, remain conserved in an elastic collision?

OR

Under what condition the work done by a force is zero inspite of displacement being taking place?

4. Can two streamlines cross each other, why?
5. What is no. of degree of freedom of a bee flying in a room?

SECTION - B

6. Write dimension and SI unit of
- a) Power
 - b) Impulse
7. Show that impulse of a force is equal to change in linear momentum produced by the force.
8. It is easier to pull than to push a lawn roller. Why?
9. If no external torque acts on a body, will its angular velocity remains conserved?
10. Derive Stoke's law of viscosity.
11. What is the heat associated with adiabatic process and what is the change in internal energy for isothermal process?

OR

A Carnot engine has the same efficiency

(I) Between 500 K and 100 K

(ii) Between 1000 K and T K

Find the value of T.

12. A simple harmonic motion is given by $X=6 \cos (100t + \pi/4)$, where x is in cm and t in second. What is the displacement amplitude and frequency?

OR

What is total internal reflection? Write its conditions.

SECTION - C

13. A physical quantity P is related to four observables a, b, c and d as follows $P = a^3b^2/cd^{1/2}$. The percentage errors of measurement in a, b, c, and d are 1%, 3%, 4%, and 2%, respectively. What is the percentage error in the quantity P? If the value of P calculated using the above relation turns out to be 3.863, to what value should you round off the result?
14. Derive graphically
- (i) $v = u + at$
- (ii) $s = ut + \frac{1}{2}at^2$
15. State Newton's second law of motion. Using the law derive the expression of force.

OR

Explain why?

- i. A horse cannot pull a cart and run in empty space.
 - ii. A cricketer moves his hands backwards while holding a catch.
 - iii. Passengers are thrown forward from their seats when speeding bus stops suddenly.
16. Show that energy remains conserved in freely falling body.
 17. State and prove law of conservation of angular momentum.

Or

State parallel axis theorem. Calculate moment of inertia of a Ring of radius R and mass M about its diameter and tangent if its moment of inertia about an axis passing through its centre and perpendicular to its plane is MR^2 .

18. Define escape velocity. Obtain an expression for escape velocity.
19. State universal law of gravitation. Derive relation between g and G .
20. Explain why?
 - (i) Water wets the glass while mercury does not.
 - (ii) A drop of liquid under no external force is always spherical in shape.
 - (iii) A balloon with hydrogen in it rises up but a balloon with air comes down.
21. Define C_p and C_v . Derive the relation between them.

Or

What is isothermal process? Obtain an expression for work done in isothermal process.

22. Estimate the value of γ for
- (i) monoatomic
 - (ii) diatomic
 - (iii) Triatomic gases.
23. Two Sitar strings A and B playing the note "Ga" are slightly out of tune and produce beats of frequency 6 Hz. The Tension in the string A is slightly reduced and the beat frequency is found to reduce to 3 Hz. If the original frequency of A is 324 Hz, then What is the frequency of B?

Or

A train, standing at the outer signal of a railway station blows a whistle of frequency 400 Hz in still air.

- (i) What is the frequency of the whistle for a platform observer when the train
 - (a) Approaches the platform with a speed of 10 m/s.
 - (b) Recedes from the platform with a speed of 10 m/s.
 - (ii) What is the speed of sound in each case? The speed of sound in still air can be taken as 340 m/s.
24. Draw a ray diagram showing the image formation by a compound microscope and obtain expression for its magnification when image is formed at least distance of distinct vision.

SECTION - D

25. a) Derive an expression for horizontal range of a projectile. Also, show

that there are two angles of projection for the same horizontal range.

- b) A bullet fired at an angle of 30° with the horizontal hits the ground 3 Km away. By adjusting its angle of projection, can one hope to hit a target 5 Km away? Assume the muzzle speed to be fixed, and neglect air resistance.

OR

- a) State parallelogram law of vector addition. Derive the expression for the resultant of two vectors P and Q acting at an angle α .
- b) Two forces whose magnitude are in the ratio 3:5 give a resultant of 28 N, if the angle of their inclination is 60° . Find the magnitude of each force.
26. (i) State and prove Bernoulli's theorem.
- (ii) The flow of speeds on the upper and lower wings of an aeroplane are 70 m/s and 63 m/s respectively. What is the lift on the wings, if its area is 2.5 m^2 ? Take density of air to be 1.3 kg/m^3 .

OR

- (i) What is capillarity? Derive an ascent formula for the rise of liquid in a capillary tube.
- (ii) A capillary of radius 0.05cm is immersed in water. Find the value of rise of water in capillary if value for the surface tension is 0.073 N/m and angle of contact is 0° .
27. (i) Derive lens maker's formula.
- (ii) The radii of curvature of the faces of a double convex lens are 10 cm

and 15 cm. If the focal length of the lens is 12 cm, find the refractive index of the material of the lens.

Or

- (i) Derive relation between angle of incidence, angle of emergence, angle of prism and angle of deviation when a ray of light is refracted through the prism.
- (ii) A ray of light suffers minimum deviation, while passing through a prism of refractive index 1.5 and refracting angle 60° . Calculate the angle of deviation and angle of incidence. Given $\text{Sin}^{-1}(0.75) = 48.6^\circ$.

