# AMRITA VIDYALAYAM

## SECOND TERMINAL EXAMINATION 2018 -'19

**Class : XI** **Marks : 70**

**Time : 3 hrs**

## PHYSICS (042)

***GENERAL INSTRUCTIONS:***

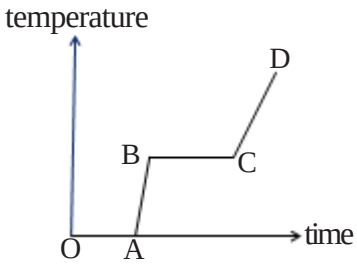
***1. All questions are compulsory.***
***2. Section A consists of 5 questions of 1 mark each.***
***3. Section B consists of 7 questions of 2 marks each.***
***4. Section C consists of 12 questions of 3 marks each.***
***5. Section D consists of 3 questions of 5 marks each.***

### SECTION - A

1. Is angular velocity a scalar or vector quantity? Write it's SI unit.
2. A wire is stretched to double its original length. What is the value of longitudinal strain?
3. Deep water runs slowly. Why?
4. State law of equipartition of energy.
5. What is the length of a simple pendulum, which ticks seconds?

### SECTION - B

6. State Kelvin-Planck and Clausius statements of second law of thermodynamics.
7. Is there any relation connecting torque and angular momentum in rotational motion? If yes derive the expression.
8. In many games such as cricket and tennis we notice that a spinning ball deviates from its parabolic trajectory as it moves through air. Which theorem connecting with fluids is applied here? Explain.
9. Find out the ratio of 2 specific heat capacities for a monoatomic gas.
10. It is realized that the skill in swinging at greater heights is related to resonance. Justify your answer.
11. a) What is meant by thermal equilibrium?
    b) What is the significance of regions OA and BC in the following graph?




12. A structural steel rod has a radius of 10 mm and a length of 1.0m. A 100 kN force stretches it along its length. Calculate
    a) stress. b) elongation. c) strain on the rod.
    Young's modulus, of structural steel is $2.0 \times 10^{11}$ $Nm^{-2}$.

### SECTION - C

13. It is impossible to make a heat engine with 100% efficiency. Why?
14. At a depth of 1000 m in an ocean
    a) what is the absolute pressure? b) what is the gauge pressure?
    c) Find the force acting on the window of area 20 cm × 20 cm of a submarine at this depth, the interior of which is maintained at sea-level atmospheric pressure. (The density of sea water is

$1.03 \times 10^3$ kg $m^{-3}$, g = 10m $s^{-2}$).

15. Define moment of inertia. Write any two factors on which it depends. When the diver leaves the diving board, why he brings his hand and feet closer together in order to make a somersault?

OR

Define torque. Find the torque of a force $7\hat{i} + 3\hat{j} - 5\hat{k}$ about the origin. The force acts on a particle whose position vector is $\hat{i} - \hat{j} + \hat{k}$.

16. Draw the stress-strain curve for a loaded wire. On the graph mark
a) Hooke's law region. b) Elastic limit. c) Yield point. d) Breaking point.

17. What is the significance of Reynold's number? Differentiate between stream lined and turbulent flow of the fluid on the basis of Reynold's number.

18. How can we apply the knowledge of elasticity while constructing bridges?

19. What is thermal expansion? Derive the relationship between coefficient of linear expansion and co-efficient of volume expansion.

20. State Newton's law of cooling. Deduce the relation $\log_e (T - T_o) = kt + c$, where T and $T_o$ are the temperature of the hot body and the surroundings respectively.

21. Define surface tension. Derive the relation between surface tension and surface energy.

22. What is meant by Simple Harmonic Motion (SHM)? Derive the differential equation for SHM.

23. A sphere of aluminium of 0.047 kg is placed for sufficient time in a vessel containing boiling water, so that the sphere is at $100^0$C. It is then immediately transferred to 0.14 kg copper calori meter containing 0.25 kg of water at $20^0$C. The temperature of water rises and attains a steady state at $23^0$C. Calculate the specific heat capacity of aluminium.
[Specific heat capacity of water (Sw) = $4.18 \times 10^3$ J $kg^{-1}$ $K^{-1}$, specific heat capacity of copper calorimeter = $0.386 \times 10^3$ J $kg^{-1}$ $k^{-1}$]

24. How can we apply Pascal's law in Hydraulic lift?

## SECTION - D

25. State and explain parallel and perpendicular axes theorems with a labelled diagram.

OR

The moment of inertia of a uniform circular disc about a tangent in its own plane is 5/4 $MR^2$, where M is the mass and R is the radius of the disc. Find the moment of inertia about an axis
a) through it's centre. b) perpendicular to it's plane.

26. State Bernoulli's theorem. Prove that the total energy possessed by a flowing ideal liquid is conserved, stating assumption used.

OR

What is meant by the term co-efficient of viscosity? State Stoke's law. Define terminal velocity and derive an expression for the terminal velocity of a sphere falling through a viscous liquid such as glycerin.

27. Define two specific heats of a gas. Which is greater and why?
Prove that Cp - Cv = R where the symbols have their usual meaning.

OR

Draw the P-V diagram for Carnot cycle. Write the name of the thermodynamic process carried out by each part of the cycle. Label and shade the area corresponding to network done by the engine in one cycle.