Part -III
PHYSICS, Paper - I
(English Version)

Time : 3 Hours **Max. Marks : 60**

Note :- Read the following instructions carefully -

(i) Answer all the questions of Section-A. Answer any six questions in Section-B and answer any two questions in Section-C.

(ii) In Section-A, questions from Sr. Nos. 1 to 10 are Very Short Answer Type. Each question carries two marks. Answer all questions at one place in the same order.

(iii) In Section-B, questions from Sr. Nos. 11 to 18 are of Short Answer Type. Each question carries four marks.

(iv) In Section-C, question from Sr. Nos. 19 to 21 are of Long Answer Type. Each question carries eight marks.

SECTION – A

10×2=20

Note :- Answer all questions.

1. What is the contribution of S. Chandrasekhar to Physics?
2. Why do we have different units for the same physical quantity?
3. $\vec{A} = \vec{i} + \vec{j}$. What is the angle between the vector and x-axis?
4. What is inertia? What gives the measure of inertia?
5. Define average pressure. Mention its unit and dimensional formula. Is it a scalar or a vector?
6. What is the pressure on a swimmer 10 m below the surface of a lake?
7. Distinguish between heat and temperature.
8. Find the increase in temperature of aluminium rod if its length is to be increased by 1%. (α for aluminium = 2.5×10^{-6}/ °C).
9. Define mean free path.
10. When does a real gas behave like an ideal gas?

SECTION – B

6×4=24

Note :- Answer any six questions.

11. A car travels the first third of a distance with a speed of 10 kmph, the second third at 20 kmph and the last third at 60 kmph. What is its mean speed over the entire distance?

12. A force $2\hat{i} + \hat{j} - \hat{k}$ newton acts on a body which is initially at rest. At the end of 20 seconds, the velocity of the body is $4\hat{i} + 2\hat{j} - 2\hat{k}$ ms^{-1}. What is the mass of the body?

13. Mention the methods used to decrease friction.

14. Distinguish between centre of mass and centre of gravity.

15. Define angular acceleration and torque. Establish the relation between angular acceleration and torque.

16. How does the acceleration due to gravity (g) change for the same values of height (h) and depth (d).

17. Describe the behavior of a wire under gradually increasing load.

18. Explain conduction, convection and radiation with examples.

SECTION – C

2×8=16

Note :- Answer any two questions.

19. (a) State and prove Law of Conservation of Energy in case of a freely falling body.

    (b) A machine gun fires 360 bullets per minute and each bullet travels with a velocity of 600 ms^{-1}. If the mass of each bullet is 5 gm, find the power of the machine gun.

20. (a) Define simple harmonic motion. Show that the motion of (point) projection of a particle performing uniform circular motion on any diameter is simple harmonic.

    (b) On an average a human heart is found to beat 75 times in a minute. Calculate its frequency and period.

21. Explain reversible and irreversible processes. Describe the working of Carnot Engine. Obtain an expression for the Efficiency.