

Time: **2 hours**; Maximum Marks: **80**

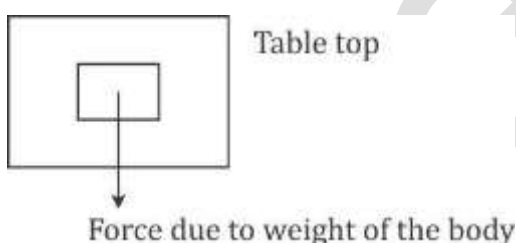
General Instructions:

1. Answers to this paper must be written on the paper provided separately.
2. You will **not** be allowed to write during the first **15** minutes. This time is to be spent in reading the question paper.
3. The time given at the head of paper is the time allotted for writing the answers.
4. Attempt **all** questions from **Section I** and **any four** questions from **Section II**.

Section - I (40 Marks)

Question 1

- (a) When a body is placed on a table top, it exerts a force equal to its weight downwards on the table top but does not move or fall. [2]



- (i) Name the force exerted by the table top.
 - (ii) What is the direction of the force?
- (b)
- (i) Name one factor that affects the lateral displacement of light as it passes through a rectangular glass slab.
 - (ii) On reversing the direction of the current in a wire, the magnetic field produced by it gets _____.
- (c)
- (i) On what factor does the position of the centre of gravity of a body depend?
 - (ii) What is the SI unit of the moment of force?
- (d) Name the factors affecting the turning effect of a body.
- (e)
- (i) Define equilibrium.
 - (ii) In a beam balance when the beam is balanced in a horizontal position, it is in _____ equilibrium.

Question 2

- (a) How is work done by a force measured when the force:
- (i) is in the direction of displacement?
 - (ii) is in an angle to the direction of displacement?
- (b) State the energy in the following while in use:
- (i) Burning of a candle.

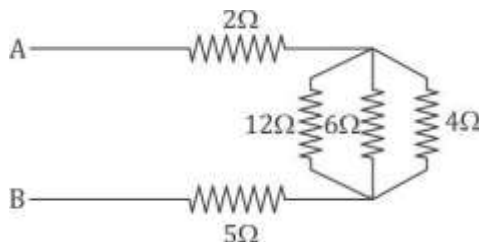
- (ii) A steam engine.
- (c)
 - (i) A scissor is a _____ multiplier.
 - (ii) 1 kWh = _____ J.
- (d) Explain the motion of a planet around the Sun in a circular path.
- (e) Rajan exerts a force of 150 N in pulling a cart at a constant speed of 10 m/s. Calculate the power exerted.

Question 3

- (a)
 - (i) Give the expression for mechanical advantage of an inclined plane in terms of the length of an inclined plane.
 - (ii) Name a common device where a gear train is used.
- (b) The speed of light in glass is 2×10^5 km/s. What is the refractive index of glass?
- (c)
 - (i) Draw a graph between displacement and the time for a body executing free vibrations.
 - (ii) Where can a body execute free vibrations?
- (d)
 - (i) What happens to the resistivity of semi-conductor with the increase of temperature?
 - (ii) For a fuse, higher the current rating _____ is the fuse wire.
- (e)
 - (i) Name the high energetic invisible electromagnetic waves which help in the study of the structure of crystals.
 - (ii) State an additional use of the waves mentioned in part (e)(i).

Question 4

- (a) Rishi is surprised when he sees water boiling at 115°C in a container. Give reasons as to why water can boil at the above temperature.
- (b)
 - (i) Why does a current carrying, freely suspended solenoid rest along a particular direction?
 - (ii) State the direction in which it rests.
- (c) Find the equivalent resistance between points A and B.



- (d) Give two similarities an AC generator and a DC motor

- (e)
- (i) Why is a cathode ray tube evacuated to a low pressure?
 - (ii) What happens if the negative potential is changed on a grid?

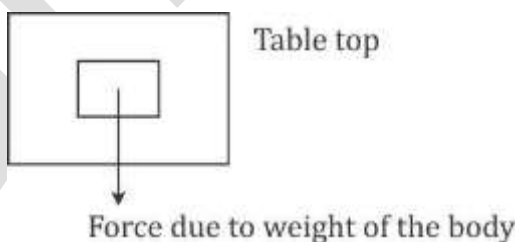
Section - II (40 Marks)

Question 5

- (a) Draw a simplified diagram of a lemon crusher, indicating of load and effort.
- (b)
 - (i) Name the physical quantity measured in terms of horse power.
 - (ii) A nut is opened by a wrench of length 20 cm. If the least force required is 2N, find the moment of force needed to loosen the nut.
 - (iii) Explain briefly why the work done by a fielder when he takes a catch in a cricket match is negative.
- (c) A block and tackle system has V.R. = 5.
 - (i) Draw a neat labelled diagram of a system indicating the direction of its load and effort.
 - (ii) Rohan exerts a pull of 150 kgf. What is the maximum load he can raise with this pulley system if its efficiency = 75%?

Question 6

- (a)
 - (i) Where an object should be placed so that a real and inverted image of the same size as the object is obtained using a convex lens?
 - (ii) Draw a ray diagram to show the formation of the image as specified in the part a (i).

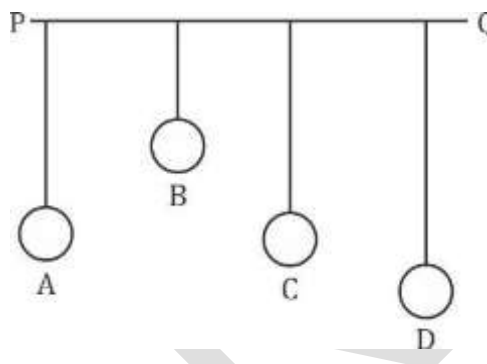


- (b)
 - (i) Why does the Sun appear red at sunrise?
 - (ii) Name the subjective property of light related to its wavelength.
- (c) Jatin puts a pencil into a glass container having water and is surprised to see the pencil in a different state.
 - (i) What change is observed in the appearance of the pencil?
 - (ii) Name the phenomenon responsible for the change.
 - (iii) Draw a ray diagram showing how the eye sees the pencil.

Question 7

- (a)

- (i) State the safe limit of sound level in terms of decibel for human hearing.
 - (ii) Name the characteristic of sound in relation to its waveform.
- (b) A person standing between two vertical cliffs and 480 m from the nearest cliff shouts. He hears the first echo after 3s and the second echo 2s later. Calculate:
- (i) The speed of sound.
 - (ii) The distance of the other cliff from the person.
- (c) In the diagram below, A, B, C, D are four pendulums suspended from the same elastic string PQ. The length of A and C are equal to each other while the length of pendulum B is smaller than that of D. Pendulum A is set in to a mode of vibrations.



- (i) Name the type of vibrations taking place in pendulums B and D?
- (ii) What is the state of pendulum C?
- (iii) State the reason for the type of vibrations in pendulum B and C.

Question 8

- (a)
- (i) Name the device used to increase the voltage at a generating station.
 - (ii) At what frequency is AC supplied to residential houses?
 - (iii) Name the wire in a household electrical circuit to which the switch is connected.
- (b) The relationship between the potential difference and the current in a conductor is stated in the form of a law.
- (i) Name the law.
 - (ii) What does the slope of V-I graph for a conductor represent?
 - (iii) Name the material used for making the connecting wire.