

Name Roll No..... Date.....

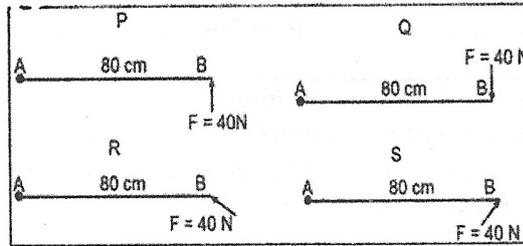
*Answers to this Paper must be written on the paper provided separately.**You will not be allowed to write during first 15 minutes.**This time is to be spent in reading the question paper.**The time given at the head of this Paper is the time allowed for writing the answers.**Section A is compulsory. Attempt any four questions from Section B.**The intended marks for questions or parts of questions are given in brackets [].***SECTION A***(Attempt all questions from this Section.)***Question 1****[15]**

Choose the correct answers to the questions from the given options.

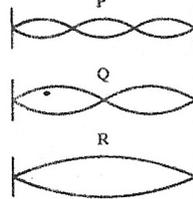
(Do not copy the questions, write the correct answers only)

- (i) Clockwise moment produced by a force about a fulcrum is considered to be _____.
 (a) positive (b) negative
 (c) zero (d) both (a) and (b)
- (ii) If there are n movable pulleys with one fixed pulley, the mechanical advantage is given by :
 (a) 2^n (b) 2^{n-1}
 (c) 2^{n+2} (d) 2^{n+1}
- (iii) The weight of a uniform half meter scale would act at ____ mark.
 (a) 0 cm (b) 25 cm
 (c) 50 cm (d) 100 cm
- (iv) If a lens is immersed in water, its focal length:
 (a) decreases (b) increases
 (c) remains unchanged (d) All of the above
- (v) The centre of gravity of a body is the point about which the algebraic sum of moments of weights of all the particles constituting the body is:
 (a) 0 (b) < 1
 (c) 1 (d) > 1
- (vi) A ray of light passes obliquely from an optical medium of refractive index 1.33 to another medium of refractive index 1.5. While passing from the first medium to the second, the light ray will:
 (a) bend away from the normal. (b) bend towards the normal.
 (c) move along the normal. (d) suffer total internal reflection
- (vii) For normal ears, sensitivity is maximum at the frequency :
 (a) 5 kHz (b) 10 kHz
 (c) 1 kHz (d) 500 Hz
- (viii) Angle of minimum deviation is equal to the angle of prism A of an equilateral glass prism. The angle of incidence at which minimum deviation will be obtained is –
 (a) 60° (b) 30°
 (c) 45° (d) 90°

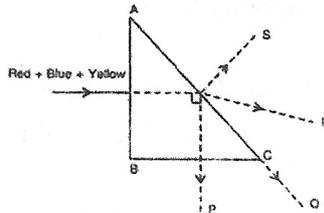
- (ix) The diagrams below show a force $F = 40\text{ N}$ acting on a rod AB pivoted at A in different directions. Identify the correct statement



- (a) P and S have opposite moments.
 (b) The magnitude of the moment of force is maximum in R.
 (c) The magnitude of the moment of force is maximum in P and Q.
 (d) The moment of force in R is negative
- (x) The correct relationship between the mechanical advantage (M.A.), the velocity ratio (V.R.) and the efficiency (η) is :
 (a) $M.A. = \eta \times V.R.$ (b) $\eta = M.A. \times V.R.$
 (c) $V.R. = \eta \times M.A.$ (d) Both (a) and (b)
- (xi) Assertion (A): Ultraviolet radiations are scattered more as compared to the microwave radiations.
 Reason (R): Wavelength of ultraviolet radiation is more than the wavelength of microwave radiation.
 (a) Both A and R are true. (b) A is true but R is false.
 (c) A is false but R is true. (d) Both A and R are false.
- (xii) An endoscope uses optical fiber to transmit high resolution images of internal organs without loss of information. The phenomenon of light that governs the functioning of the optical fiber is:
 (a) refraction (b) reflection
 (c) scattering (d) total internal reflection.
- (xiii) What is the ratio of wavelengths between P, Q and R?



- (a) 3:2:1 (b) 1:2:3
 (c) 6:3:2 (d) 2:3:6
- (xiv) A beam consisting of red, blue and yellow colours is incident normally on the face AB of an isosceles right-angled prism ABC as shown in the figure given below. Critical angle of glass-air interface for yellow colour is 45° .



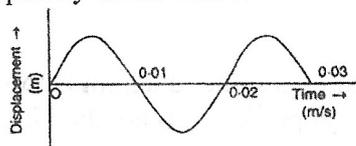
Out of the four emergent rays P, Q, R and S, which one is for the yellow colour :

- (a) P (b) Q
 (c) R (d) S
- (xv) In the order of increasing frequency, the electromagnetic spectrum may be arranged as
 (a) Gamma rays, X-rays, visible light, radio waves
 (b) X-rays, gamma rays, visible light, radio waves
 (c) Radio waves, visible light, gamma rays, X-rays
 (d) Radio waves, visible light, X-rays, gamma rays

Question 2

[10]

- (i) Complete the following by choosing the correct answers from the bracket: [6]
- (a) In a block and tackle system, increase in the weight of the movable block _____ [decreases, does not effect, increases] the efficiency of the pulley system.
- (b) Linear magnification(m) produced by a concave lens is _____ [greater, equal, less] than 1.
- (c) Vibrations produced in a body under the influence of the periodic force is _____. [damped vibrations, resonant vibrations, forced vibrations]
- (d) The energy of atomic particles is measured in _____. [joule, electron volt, watt]
- (e) When an object is thrown up, its potential energy _____ and kinetic energy _____. [decreases, increases / increases, increases / decreases, decreases / increases, decreases]
- (ii) The refractive index of diamond is 2.42. What is meant by this statement? [2]
- (iii) The diagram shown below depicts a displacement time graph of particle a wave travelling with speed 20 m/s. What is the frequency of the wave? [2]



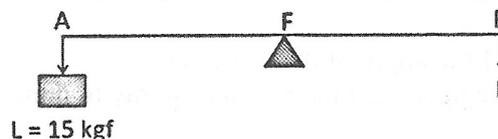
Question 3

[15]

- (i) Write the energy conversions in the following: [2]
- (a) Microphone
- (b) Burning of coal in a thermoelectric station.
- (ii) Draw a graph of potential energy vs height from the ground for a body thrown vertically upwards. [2]
- (iii) How does the intensity of scattered light depend on the wavelength of incident light? State the condition when this dependence hold. [2]
- (iv) Match the columns by choosing the body part and corresponding mechanical lever of the same class. [2]

Human body part	Mechanical lever
i. Nodding head	(a) Bottle Opener
ii. Lifting body weight on your toes.	(b) Tongs
	(c) See-Saw

- (v) State two differences between normal reflection and total internal reflection. [2]
- (vi) Two bodies A and B have same kinetic energies. Compare their velocities if mass of A is four times the mass of B. [2]
- (vii) The diagram below shows a lever in use. [3]



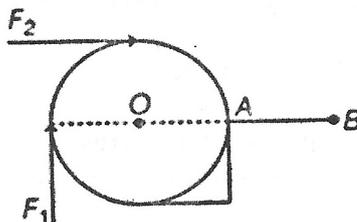
- (a) To which class of lever does it belong?
- (b) If $AB = 1\text{ m}$, $AF = 0.4\text{ m}$, find its mechanical advantage.
- (c) Calculate the value of E.

SECTION B [40]
(Attempt any four questions.)

Question 4

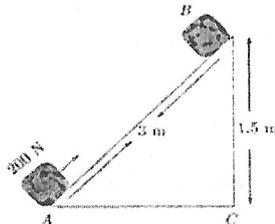
[10]

- (i) A roller with a diameter of 0.2 m is raised over a pavement AB by applying forces F_1 and F_2 , as shown in the diagram.



If the magnitude of both forces is 20 N, then compare the magnitudes of the torques produced by the two forces. [3]

- (ii) A block of mass 30 kg is pulled up a slope (diagram below) with a constant speed by applying a force of 200 N parallel to the slope. A and B are the initial and final positions of the block. Calculate the force of friction offered by the surface AB. [$g = 10\text{ms}^{-2}$] [3]

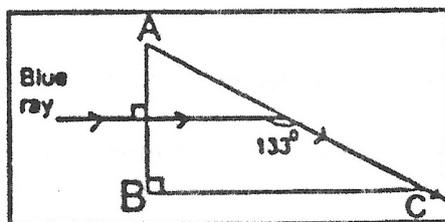


- (iii) (a) Scissors for cutting cloth have blades much longer than handles. Why? [2]
 (b) A boy uses a single fixed pulley to lift a load of 50 kgf to some height. Another boy uses a single movable pulley to lift the same load to the same height. What is the ratio of efforts applied by the pulleys. [2]

Question 5

[10]

- (i) The image of a candle flame placed at a distance 36 cm from a spherical lens, is formed on a screen placed at a distance of 72 cm from the lens. Calculate the focal length of the lens and its power. [3]
- (ii) The diagram below shows the path of a blue ray through the prism:



1. Calculate the critical angle of the prism for blue colour.
2. What is the measure of the angle of this prism (A)?
3. Which colour should replace the blue ray, for the ray to undergo Total Internal Reflection? [3]

- (iii) (a) Why do we use red colour as a danger signal on the top of a sky scraper? [2]
 (b) A glass block 3.0 cm thick is placed over a stamp. Calculate the height through which the image of the stamp is raised. Refractive index of glass is 1.5. [2]

Question 6

[10]

- (i) Which class of levers has a mechanical advantage always greater than one? Give reason with one example. What change can be brought about in this lever to increase its mechanical advantage? [3]
- (ii) How fast should a man weighing 600N run so that his kinetic energy is 750J? Take $g=10\text{ms}^{-2}$ [3]
- (iii) The diagram below shows a block and tackle system. [4]

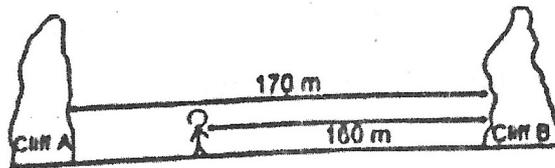


- (a) Copy and complete the labelled diagram showing the correct connection of the tackle, the direction of the forces involved to obtain maximum V.R. with the convenient direction.
- (b) Calculate the M.A. of this pulley system if its efficiency is 80%.

Question 7

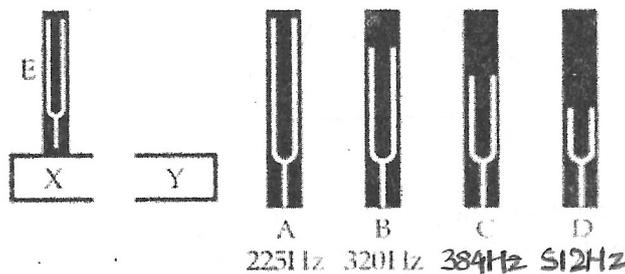
[10]

- (i) (a) Name the waves used in SONAR. [3]
- (b)



In the above diagram Lata stands between two cliffs and claps her hands. Determine the time taken by her to hear the first echo. Speed of sound in air is 320ms^{-1} .

- (ii) The diagram below shows a vibrating tuning fork E mounted on a sound box X. When the vibrating tuning forks A, B, C and D are placed on the sound box Y one by one, it is observed that a louder sound is produced when the tuning fork B is placed on Y. [3]



- (a) What is the frequency of tuning fork E
- (b) Why does B produce a louder sound? State the principle illustrated by the above experiment.
- (iii) (a) Two waves of the same pitch have amplitudes in the ratio 1 : 3. What will be the ratio of their (i) loudness and (ii) frequencies? [2]
- b) Draw a graph between displacement and time for a body executing natural vibrations. [2]

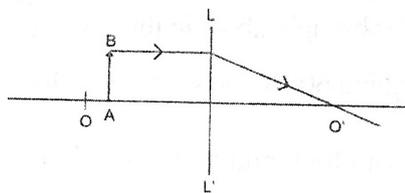
Question 8

[10]

- (i) A uniform metre scale can be balanced at the 70cm mark when a mass of 0.05Kg is hung from the 94cm mark.
 1. Draw the diagram of the arrangement
 2. Find the mass of the metre scale. [3]

(ii) Study the diagram given below.

[3]

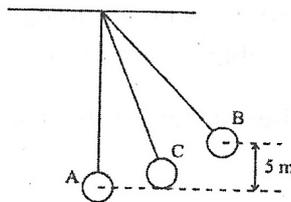


(a) Name the lens LL'.

(b) Complete the diagram to form the image of the object AB.

(iii) The figure below shows a simple pendulum of mass 200 g. It is displaced from the mean position A to the extreme position B. The potential energy at the position A is zero. At the position B the pendulum bob is raised by 5 m.

[4]



(a) What is the potential energy of the pendulum at the position B?

(b) What is the total mechanical energy at point C?

(c) What is the speed of the bob at the position A when released from B?

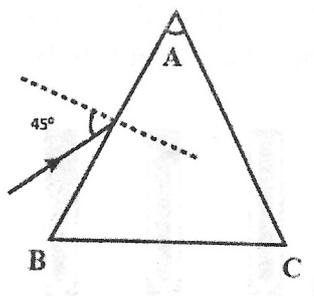
[Take $g=10 \text{ ms}^{-2}$ and given that there is no loss of energy.]

Question 9

[10]

(i) A monochromatic ray of light is incident on an equilateral prism placed at minimum deviation position with an angle of incidence 45° as shown in the diagram.

[3]



a) Copy the diagram and complete the path of the ray.

(b) State two factors on which angle of deviation depends

(ii) An electric heater of power 3 kW is used for 10 h. How much energy does it consume? Express your answer in

(i) kWh

(ii) joule.

[3]

(iii) (a) State the condition for each of the following :

1. lens has both its focal lengths equal.

2. ray passes undeviated through the lens.

[2]

b) A wave has a wavelength of 10^{-3} nm . (i) Name the wave. (ii) State it's one property different from light.

[2]