NAME OF STUDENT : ....

DATE : ....

MAX. MARKS : 80

TIME : 2 HOURS

NOTE: You will not be allowed to write during the 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 I is compulsory. Attempt any four questions from Section II.

*The intended marks for questions are given in brackets [].

All subparts of the question attempted must be answered in the correct serial order.

SECTION – A
(Attempt all questions from this section.)

Q.1:- [1X15]

(i) A moment of couple has a tendency to rotate the body in an anticlockwise direction. Then the moment of couple is taken as :
  a) positive
  b) negative
  c) maximum
  d) zero

(ii) When a bell fixed on a cycle rings, then the energy conversion that takes place is:
  a) gravitational potential energy to sound energy
  b) kinetic energy to sound energy
  c) sound energy to electrical energy
  d) sound energy to mechanical energy.

(iii) The moment of force applied on a door is 18 N-m and a force of 4.5 N is applied by a boy, the distance of the handle from the pivot is:
  a) 0.25 m
  b) 0.75 m
  c) 2.25 m
  d) 4.0 m

(iv) When mass and velocity of the body are doubled then its kinetic energy will..........:
  a) increase by 8 times
  b) decrease by 8 times
  c) increase by 4 times
  d) remain same

(v) The energy conversion in a washing machine is from _____
  a) magnetic to electrical
  b) electrical to mechanical
  c) electrical to magnetic
  d) mechanical to electrical

(vi) A falling raindrop has:
  a) only Kinetic energy
  b) only potential energy
  c) both kinetic and potential energy
  d) none of these.

(vii) For a convex lens, the minimum distance between an object and its real image in terms of focal length f of a given lens must be:
  a) 1.5f
  b) 2.5f
  c) 2f
  d) 4f

(viii) A simple machine whose MA is always greater than 1 is :
  a) inclined plane
  b) lever
  c) pulley
  d) ideal machine

(ix) The velocity ratio of single movable pulley is always :
  a) 0
  b) 3
  c) 1
  d) 2

(x) A beam balance is an example of :
  a) inclined plane
  b) lever of Ist order
  c) lever of IInd order
  d) lever of IIIrd order

(xi) An object in a denser medium when viewed from a rare medium appears to be raised. The shift is maximum for :
  a) yellow light
  b) red light
  c) violet light
  d) green light

(xii) Assertion(A) : The emergent ray is parallel to the direction of the incident ray.

Reason (R)   : The extent of bending of the ray of light at the opposite parallel faces (air- glass interface and glass-air interface) of the rectangular glass slab is equal and opposite.

    (a) Both A and R are true and R is the correct explanation of A.

    (b) Both A and R are true but R is not the correct explanation of A.

    (c) A is true but R is false.

    (d) A is false but R is true.

(xiii) Vibrations produced in a body under influence of the periodic force is:

    a) forced vibrations   b) resonant vibrations

    c) damped vibrations   d) sympathetic vibrations

(xiv) The speed of sound is maximum in :

    a) copper   b) air

    c) water   d) vacuum

(xv) A block of glass is pushed into the path of the light as shown below. Then the converging point X will:
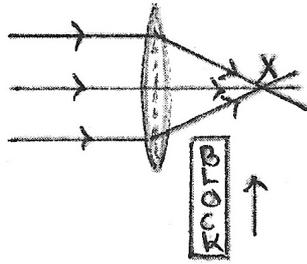
    a) move away from the slab

    b) move towards the slab

    c) not shift

    d) move towards the left side of the lens

Q.2:-

(i) Complete the following by choosing the correct answers from the bracket: **[6]**

    a) The work done by the heart for each beat is 1 joule. The power of heart is _____W [1.5 / 1.2 / 1.8] if it beats 72 times in a minute.

    b) The centre of gravity of a body is the point about which the algebraic sum of moments of weights of all particles constituting the body is _____. [zero / positive / negative]

    c) If effort needed is less than load, then MA of machine is _____. [less than 1 / equal to 1 / greater than 1]

    d) If an object placed in front of thick mirror viewed obliquely, a number of images are seen. Out of these images, the _____ [first / second / last] image is the brightest.

    e) If a lens is placed in water instead of air, its focal length _____. [increases / decreases / remains the same]

    f) When the frequency of externally applied periodic force on a body is _____ [equal to /less than / greater than] its natural frequency, the body readily begins to vibrate with an increased amplitude.

(ii) What do you understand by the term dispersion? **[2]**

(iii) Name the region just beyond (i) the red end, and (ii) the violet end, of the spectrum. **[2]**

Q.3:-

(i) Draw the labelled sketch of class I, class II and class III lever. **[3]**

(ii) The diagram shows wheel O pivoted at point A. Three equal forces F_1, F_2 and F_3 act at point B on the wheel. **[2]**
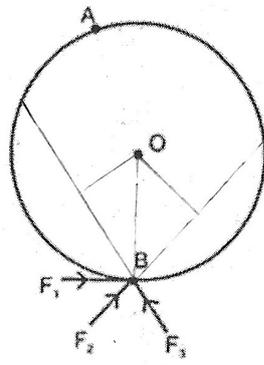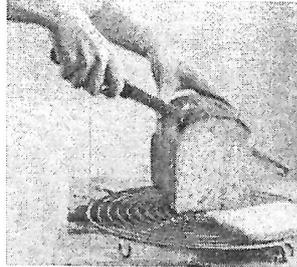
a) Which force will produce maximum moment about A?

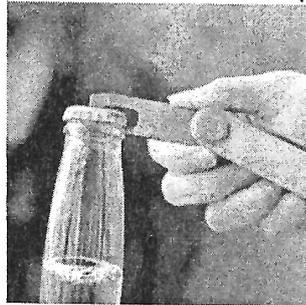b) Give a reason for your answer in (a)

(iii) To which class do the following levers belong?   [2]
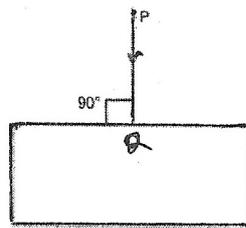
a) A man cutting bread with a knife,

b) Name the class of the lever shown in the picture below.

(iv) A ray of light PQ is incident on a glass slab as shown in figure. Write the value of angle of incidence and angle of refraction for this ray of light.   [2]

(v) State two conditions necessary for total internal reflection to occur.   [2]

(vi) Draw a graph of potential energy vs height from the ground for a body thrown vertically upwards.   [2]

(vii) A microphone is connected to the input of a C.R.O. Three different sounds are made in turn in front of the microphone. Their traces (a), (b) and (c) produced on the screen are shown in figure.   [2]
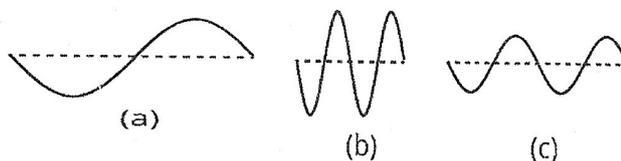
a) Which trace is due to the loudest sound?

b) Which trace is due to the sound with the lowest pitch?

Q.4:-

(i) Figure below shows a uniform metre rule AB pivoted at its end A at zero mark and supported at the other end B by a spring balance when a weight of 40 kgf is suspended at its 40 cm mark. This rule stays horizontal. Find the reading of the spring balance when the rule is of negligible mass. **[3]**
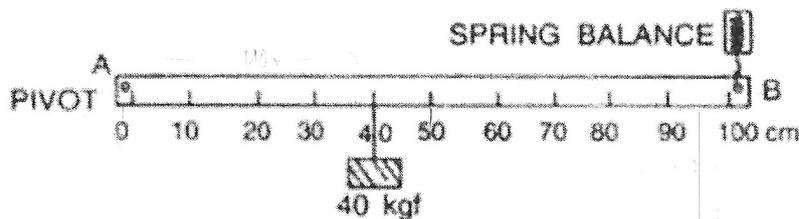
(ii) What do you understand by equilibrium of body? Give one example of each static and dynamic equilibrium. **[3]**

(iii) A pair of scissors is used to cut a piece of cloth by keeping it at a distance of 8 cm from its rivet and applying an effort of 10 kgf by fingers at a distance of 2 cm. Find : **[4]**

  a) The MA of scissors,
  b) The load offered by the cloth.
  c) How does the pair of scissors act : as a force multiplier or as a speed multiplier.

Q.5:-

(i) **[3]**

  a) Two masses in the ratio 1 : 4 have their speeds in the ratio 4 : 5. Find the ratio of their kinetic energy.
  b) When a book is lifted from a table, against which force work is done?

(ii) Define echo. State two conditions necessary for an echo to be heard distinctly. **[3]**

(iii) The diagram below shows a pendulum which was released from position A. **[4]**
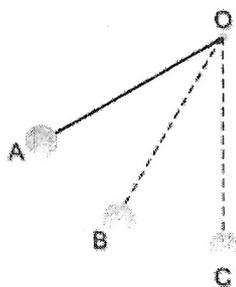
  (a) What form(s) of energy did the pendulum have at
   • A?
   • B?
   • C?
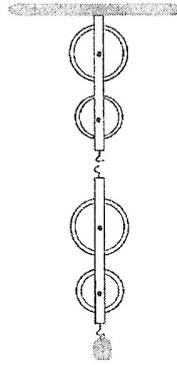 (b) Eventually the pendulum would stop moving. Explain what has happened to the initial energy of the pendulum.

Q.6:-

(i) Copy the diagram given below and complete the path of light ray till it emerges out of the prism. The critical angle of glass is 42^0. In your diagram mark the angle wherever necessary. **[3]**
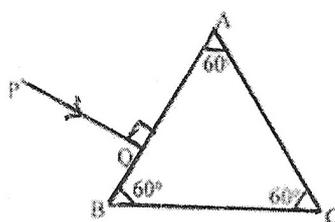
(ii) Draw a graph to show the variation in angle of deviation with angle of incidence. What is the relation between the angle of incidence and the angle of emergence when the ray suffers minimum deviation? **[3]**

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(iii) Figure shows a system of four pulleys, the upper two pulleys are fixed and lower two are movable.

    a) Draw a string around the pulleys. Also show the point of application and direction in which the effort E is applied.

    b) What is the MA and VR of the system.   [4]

Q.7:-

(i) A double convex lens with refractive index μ_1 inside two liquids of refractive indices μ_2 and μ_3 are shown in the diagrams below. The refractive indices are such that $\mu_2 > \mu_1$ and $\mu_1 > \mu_3$ [3]
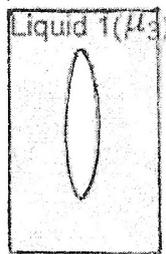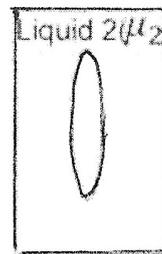

Figure a   Figure b

How would a parallel incident beam of light refract when it comes out of the lens in each of the cases shown above?

    (1) in Fig a.

    (2) in Fig b.

(ii) Figure below shows a pencil which is kept partially inside water and partially outside of water. When it is viewed from rarer medium it appears broken at point of separation of medium as shown in the figure. State which phenomenon is responsible for it? Draw a labelled ray diagram to show the phenomenon stated by you.   [3]


(iii) Name the waves -   [4]

    (a) of lowest wavelength,

    (b) used for taking photographs in dark,

    (c) of longest wavelength,

    (d) of wavelength 400 nm to 800 nm.

Q.8:-

(i) Define the term power of a lens. In what unit is it expressed? How does the power of a lens change if its focal length is doubled?   [3]

(ii) A lens forms the image of an object placed at a distance of 45 cm from it on a screen placed at a distance 90 cm on the other side of it. Name the kind of lens. Find the focal length of the lens.   [3]

(iii) An observer X is on an island 5500 m from a vertical cliff on the shore. A ship Y is *anchored between the island and the Cliff. A blast on the ships' siren is heard twice by X, the interval being 5 s.* [Velocity of sound = 330 ms^{-1}]

[4]

Cliff |←——————— 5500 m ———————→| Island
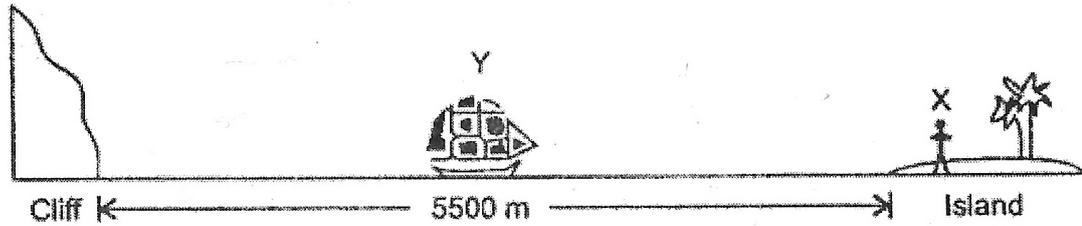
       (i) Find the distance of the ship from the island.

   **(ii)** Find the distance of the cliff from the ship.

Q.9:-

  i) The diagram below shows a wire stretched over a sonometer. Stems of two vibrating forks A and B are touched in turn to the wooden box of the sonometer. It is observed that the paper rider (a small piece of paper folder at the centre) present on the wire flies off when the stem of vibrating tuning fork B is touched to the wooden box but the paper just vibrates when the stem of vibrating tuning fork A is touched to the wooden box.

[3]

Wooden box →   Sonometer

Paper rider

10 kg
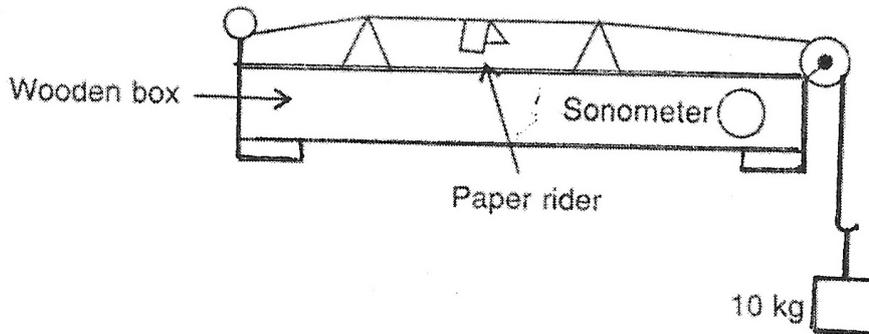
   a) Name the phenomenon when the paper rider just vibrates.

   b) Name the phenomenon when the paper rider flies off.

   c) Why does the paper rider fly off when the stem of tuning fork B is touched to the box?

(ii) A tuning fork is vibrating in air. State whether the vibrations are natural or damped? State two differences between natural and damped vibrations. [3]

(iii) The alongside diagram shows that an observer sees the image of an object O at I.

[4]

Rectangular Glass block

observer
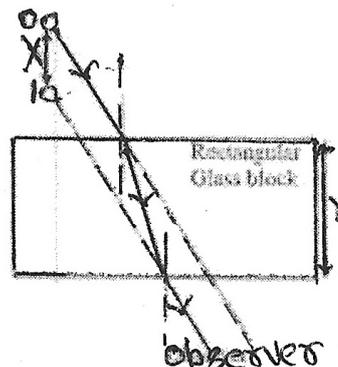
   a) Name and define the phenomenon responsible for seeing the Image at a different position.

   b) State the effect on X when:

    1) Y increases

    2) Y decreases