ICSE CLASS 10 EXAMINATION

PRACTICE QUESTION PAPER

PHYSICS

Chapter 1 : FORCE

(Moment of a Force & Equilibrium · Centre of Gravity · Uniform Circular Motion)

Maximum Marks: 40 **Time allowed: One hour**

1. Answers to this Paper must be written on the paper provided separately.

2. You will not be allowed to write during the first 5 minutes. This time is to be spent in reading the question paper.

3. The time given at the head of this Paper is the time allowed for writing the answers.

*4. **Section A** is compulsory. Attempt **all** questions from Section A and **any two** questions from Section B.*

5. The intended marks for questions or parts of questions are given in brackets [ ].

6. Show all working clearly. Draw neat, labelled diagrams wherever asked. Take g = 9.8 m s^{-2} (1 kgf = 9.8 N) wherever required.

SECTION A (20 Marks)

(Attempt all questions from this Section.)

Question 1

Choose the correct answers to the questions from the given options. *(Do not copy the question, write the correct answers only.)* **[8]**

(i) The S.I. unit of moment of force is:

(a) N (b) N m^{-1}

(c) N m (d) kg m s^{-1}

(ii) A force of 20 N is applied perpendicular to a door at a distance of 0.25 m from the hinges. The moment of force about the hinges is:

(a) 80 N m (b) 5 N m

(c) 45 N m (d) 0.0125 N m

(iii) Two forces of 5 N each act in opposite directions on the ends of a rod, 40 cm apart (couple arm 40 cm). The moment of the couple is:

(a) 200 N m (b) 2 N m

(c) 12.5 N m (d) 0.2 N m

(iv) Which of the following is an example of dynamic equilibrium?

(a) a book lying on a table (b) a horizontal beam balance

(c) a stone at the top of its flight (d) a raindrop falling with constant velocity

(v) Assertion (A): A spanner with a longer handle can loosen a tight nut more easily.

Reason (R): A longer handle increases the force applied on the nut.

(a) (A) is true and (R) is false.

(b) (A) is false and (R) is true.

(c) Both (A) and (R) are true, and (R) is the correct explanation for (A).

(d) Both (A) and (R) are true, but (R) is not the correct explanation for (A).

(vi) A uniform metre rule is balanced on a knife edge at its 50 cm mark. A weight of 40 gf is hung at the 10 cm mark. A weight of 80 gf must be hung at the:

(a) 60 cm mark (b) 70 cm mark

(c) 80 cm mark (d) 90 cm mark

(vii) The centre of gravity of a uniform circular ring lies:

(a) on the ring, at its topmost point (b) on the ring, at its lowest point

(c) at any point on the ring (d) at its centre, where there is no material

(viii) A particle moves in a circle with constant speed. Its acceleration is:

(a) directed towards the centre of the circle (b) directed along the tangent

(c) directed away from the centre (d) zero

Question 2

(a) Define moment of force. State its S.I. unit and whether it is a scalar or a vector quantity. **[2]**

(b) Fig. 1(a) and Fig. 1(b) show two identical discs, each pivoted at its centre O. The same force F is applied in the same (horizontal) direction at point A in (a) and at point B in (b). State the sense of rotation (clockwise or anticlockwise) of the disc in each case. What does this show about the effect of the point of application of a force? **[2]**

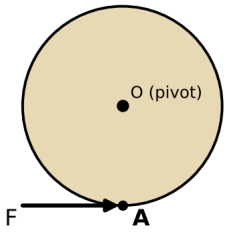


Fig. 1(a)

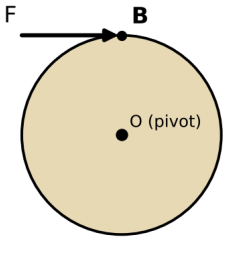


Fig. 1(b)

(c) State two differences between centripetal force and centrifugal force. **[2]**

Question 3

(a) A force of 15 N is applied perpendicular to a spanner at a distance of 20 cm from the nut. Calculate the moment of force about the nut. What force would produce the same moment if applied at 30 cm from the nut? **[3]**

(b) State the principle of moments. Fig. 2 shows a uniform metre rule pivoted at its mid-point, carrying a weight of 60 gf at the 20 cm mark and a weight of 40 gf at a point X. At which mark must X be so that the rule stays horizontal? **[3]**

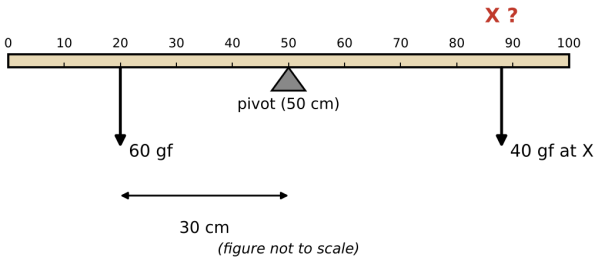


Fig. 2

SECTION B (20 Marks)

(Attempt any two questions from this Section.)

Question 4

(a) Give a reason for each of the following: (i) a spanner has a long handle; (ii) a steering wheel is made of a large diameter; (iii) the upper stone of a hand flour grinder has its handle near the rim. **[3]**

(b) A door 1.2 m broad is opened by applying a force of 25 N normal to the door at its free end. Calculate the moment of force required to open the door. If the force were applied at a distance of 0.3 m from the hinges, what force would be needed to produce the same turning effect? **[3]**

(c) Fig. 3 shows a uniform rod AB of length 2 m pivoted at O, where AO = 0.5 m. Three forces F_1 = 12 N, F_2 = 5 N and F_3 = 4 N act on the rod in the directions shown, F_3 acting at the mid-point P of OB. Taking the rod to be of negligible weight, calculate: **[4]**

(i) the moment of each force about O, stating whether it is clockwise or anticlockwise, and **[3]**

(ii) the resultant moment about O. Is the rod in rotational equilibrium? **[1]**

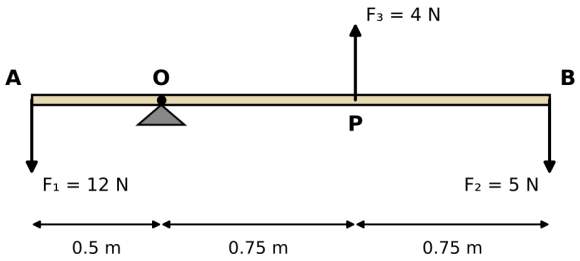


Fig. 3

Question 5

(a) Two equal and opposite forces of 15 N each act tangentially at the two ends of a diameter of a circular disc of radius 0.2 m. Calculate the moment of the couple (i) in N m and (ii) in dyne cm. Will the disc have translational motion? **[3]**

(b) Fig. 4 shows a see-saw 6 m long pivoted at its middle O. A child of mass 36 kg sits at 2 m from O. (i) Where must the child of mass 24 kg sit, on the other side, to balance the see-saw? (ii) If this child now moves 0.5 m closer to O, which side will go down and what is the resultant moment (in kgf m)? **[3]**

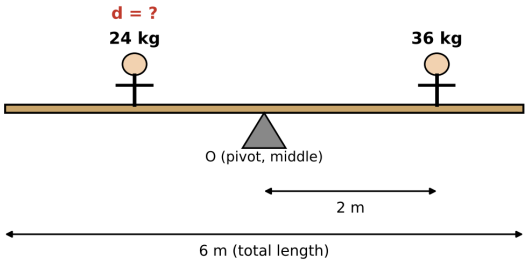


Fig. 4

(c) Fig. 5 shows a uniform metre rule AB of mass 100 g (weight 100 gf) pivoted at its end A and supported at its other end B by a spring balance. A weight of 60 gf is suspended at the 30 cm mark and the rule remains horizontal. Find (i) the reading of the spring balance, and (ii) the reaction at the pivot A. **[4]**

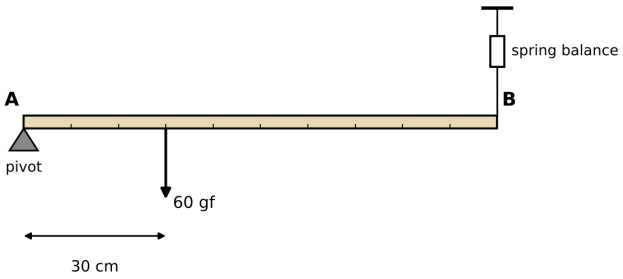


Fig. 5

Question 6

(a) Define the term *centre of gravity* of a body. Can the centre of gravity of a body lie outside its material? Give one example. State one factor on which the position of the centre of gravity depends. **[3]**

(b) A ball is tied by a string to the centre of a merry-go-round whose platform is rotating. State and explain the observations made by (i) a person standing on the ground outside, and (ii) a person standing on the rotating platform. **[3]**

(c) Fig. 6 shows a stone tied to a string and whirled in a horizontal circle with uniform speed, O being the centre and P the position of the stone at an instant. **[4]**

(i) Is the velocity of the stone uniform or variable? Give a reason. **[1]**

(ii) What is the direction of its acceleration at P? **[1]**

(iii) Name the force providing the centripetal force. **[1]**

(iv) The string breaks at P. Copy the figure and draw the path of the stone after the string breaks. **[1]**

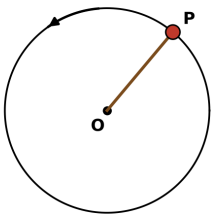


Fig. 6

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