1 (a) What do you understand by the term moment of force?

moment of a force .........................................................................................................................

..........................................................................................................................................

..........................................................................................................................................

[2]

(b) One type of weighing machine, known as a steelyard, is illustrated in Fig. 1.1.

![Steelyard diagram](image)

Fig. 1.1

The two sliding weights can be moved independently along the rod.

With no load on the hook and the sliding weights at the zero mark on the metal rod, the metal rod is horizontal. The hook is 4.8 cm from the pivot.

A sack of flour is suspended from the hook. In order to return the metal rod to the horizontal position, the 12 N sliding weight is moved 84 cm along the rod and the 2.5 N weight is moved 72 cm.

(i) Calculate the weight of the sack of flour.

weight = .................................................N [2]

(ii) Suggest why this steelyard would be imprecise when weighing objects with a weight of about 25 N.
2 (a) Explain what is meant by the centre of gravity of a body.

(b) An irregularly-shaped piece of cardboard is hung freely from one point near its edge, as shown in Fig. 2.1.

Fig. 2.1

Explain why the cardboard will come to rest with its centre of gravity vertically below the pivot. You may draw on Fig. 2.1 if you wish.

(c) Explain an experimental arrangement for centre of gravity of an irregular lamina.
3 (a) Describe an experiment to verify the principle of moments.

(b) A uniform rod is pivoted at its centre. A vertical force of 25 N acts at a distance of 30 cm from the pivot as shown in Fig. 3.1.

![Fig. 3.1](image)

A vertical force of 20 N is applied to the rod to keep the rod horizontal. Calculate the distance of the 20 N force from the pivot.

distance = ........................................... cm [3]

(c) A candlestick has a wide heavy base. State and explain why the base is both wide and heavy.

..........................................................................................................................................
..........................................................................................................................................
..........................................................................................................................................
..........................................................................................................................................
..........................................................................................................................................
..........................................................................................................................................
..........................................................................................................................................
..........................................................................................................................................
..........................................................................................................................................
..........................................................................................................................................
..........................................................................................................................................
..........................................................................................................................................
..........................................................................................................................................
..........................................................................................................................................
..........................................................................................................................................
..........................................................................................................................................
..................................................................................................................................... [2]

[Total 8]
MCQ SECTION: [Total 4 Marks]

1. A uniform metre rule of mass 100 g is supported by a knife-edge at the 40 cm mark and a string at the 100 cm mark. The string passes round a frictionless pulley and carries a mass of 20 g as shown in the diagram.

At which mark on the rule must a 50 g mass be suspended so that the rule balances?

A 4 cm  B 36 cm  C 44 cm  D 96 cm

2. A spanner is used to tighten a nut as shown.

A force $F$ is applied at right-angles to the spanner at a distance of 0.25 m from the centre of the nut. When the nut is fully tightened, the applied force is 200 N.

What is the resistive torque, in an anticlockwise direction, preventing further tightening?

A 8 N m  B 25 N m  C 50 N m  D 800 N m
3. A long uniform beam is pivoted at one end. A force of 300 N is applied to hold the beam horizontally.

![Diagram of a beam with a force applied at one end](image)

What is the weight of the beam?

A. 300 N  
B. 480 N  
C. 600 N  
D. 960 N

4. A uniform beam of weight 100 N is pivoted at P as shown. Weights of 10 N and 20 N are attached to its ends.

The length of the beam is marked off at 0.1 m intervals.

At which point should a further weight of 20 N be attached to achieve equilibrium?

![Diagram of a beam with weights and points marked](image)

MCQ Answer Sheet

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>4</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
</tbody>
</table>

Dedicated to My Son Mohammad Irtaza Zain.  
Code 5054