UNIVERSITI KUALA LUMPUR
MALAYSIA ITALY DESIGN INSTITUTE

FINAL EXAMINATION
MARCH 2026 SEMESTER

COURSE CODE	:	PTB20103
COURSE TITLE	:	MECHANICS OF MATERIALS
PROGRAMME NAME	:	BACHELOR OF ENGINEERING TECHNOLOGY
DATE	:	30 JUNE 2026
TIME	:	9:00AM - 11:30AM
DURATION	:	2 HOURS 30 MINUTES

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consist of TWO sections.
4. Answer ALL questions for Section A.
5. Section B consist of four questions. Answer THREE (3) questions only.
6. Please write your answer on the answer booklet provided.
7. Please answer all questions in English only.
8. Please answer MCQ/EMQ questions using OMR sheet. ☐ *Tick if applicable*
9. Refer to the attached Formula/ Appendies. ☐ *Tick if applicable*

THERE ARE 7 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 40 marks)

Answer ALL questions.

Please use the answer booklet provided.

Question 1

Describe the purpose of a free body diagram (FBD) in mechanics and outline the steps to create ONE for a static equilibrium problem involving a beam supported at both ends and subject to multiple point forces.

(10 marks)

Question 2

A jack AB used to straighten the bent beam DE using the arrangement shown in Figure X. The vertical compressive force AB in the jack is 2.5 kN.
Draw a Free Body Diagram of Figure X.
Refer Below - Figure1 : The Supported Beam .

(10 marks)

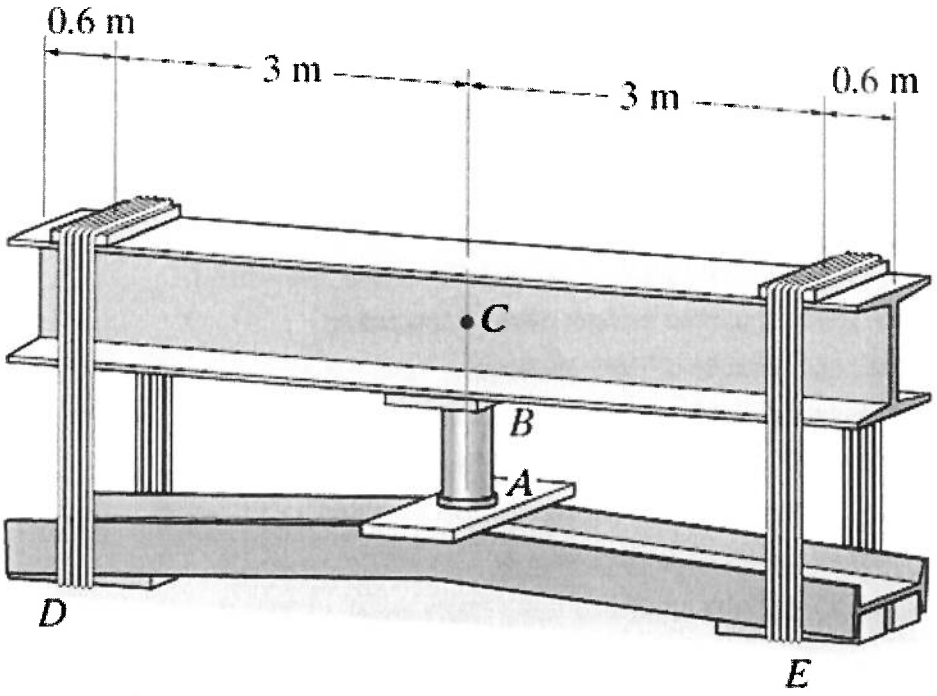


Figure 1: The Supported Beam

Question 3

Two solid cylindrical rods AB and BC are welded together at B and loaded as shown. Knowing that d_1 = 30 mm and d_2 = 50 mm. Given P = 60 kN.

Refer Below - Figure2 : The Cylindrical Rods .

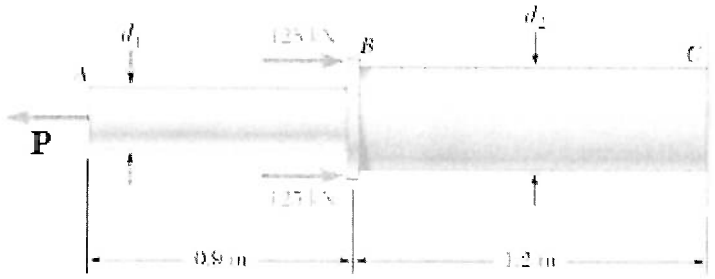


Figure 2: The Cylindrical Rods

(a) Find the average normal stress at the midsection of rod AB.

(10 marks)

(b) Find the average normal stress at the midsection of rod BC.

(10 marks)

SECTION B (Total: 60 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

Evaluate the equilibrium questions as follows:
Refer Below - Figure3 : The Truss .

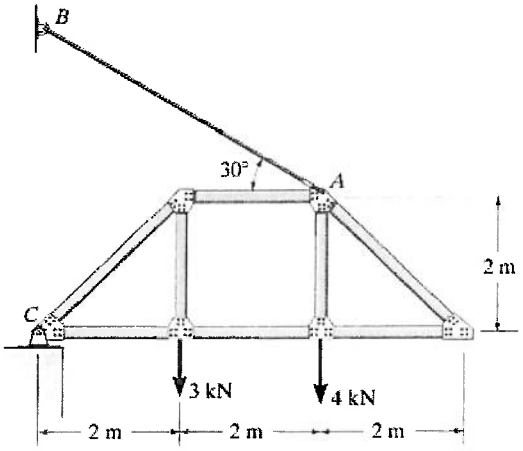


Figure 3: The Truss

(a) Draw the free body diagram of the truss that is supported by the cable AB and pin C. Explain the significance of each force acting on the diagram.

(10 marks)

(b) Calculate the horizontal and vertical components of reaction at C and the tension in the cable AB for the truss.

(10 marks)

Question 2

Evaluate the Centroid and Moment of Inertia questions as follows:

(a) Draw a centroid and moment diagram for figures b) and c), respectively.

(10 marks)

(b) Calculate the centroid of the shaded area.
Refer Below - Figure4 : The Centroid .

(5 marks)

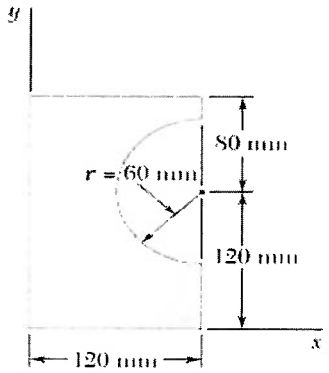


Figure 4: The Centroid

(c) Calculate the moment of inertia of the shaded area about the X-axis ONLY
Refer Below - Figure5 : The Moment of Inertia .

(5 marks)

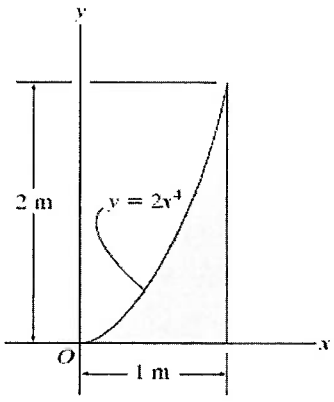


Figure 5: The Moment of Inertia

Question 3

Evaluate the bending questions as follows:
Refer Below - Figure6 : The Supported Beam .

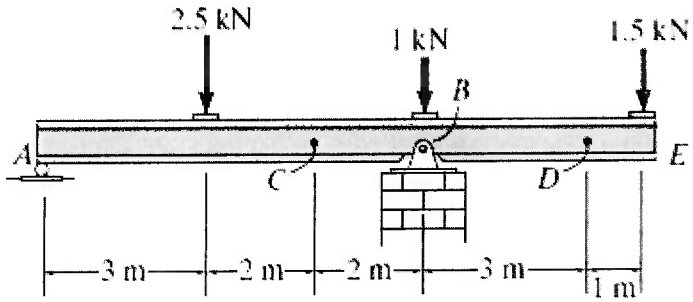


Figure 6: The Supported Beam

(a) Draw a free-body diagram (FBD) of the figure.

(10 marks)

(b) Determine the shear force and moment at Points C ONLY.

(10 marks)

Question 4

As shown in the figure, the shaft has a diameter of 14 mm. Given the shear modulus of materials is 80 GPa.

Refer Below - Figure7 : The Shaft .

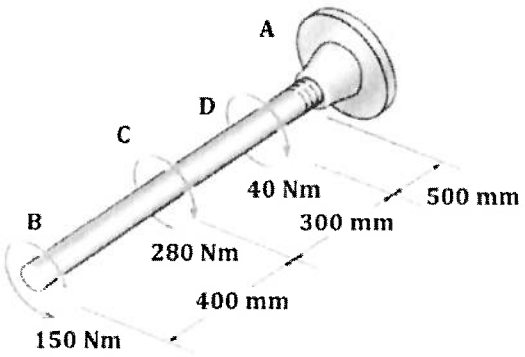


Figure 7: The Shaft

(a) Draw a torsional diagram for each section.

(10 marks)

(b) Determine the angle of twist at B.

(10 marks)

END OF EXAMINATION PAPER