Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	SOLID MECHANICS
COURSE CODE	:	DAM 21003
PROGRAMME CODE	:	DAM
EXAMINATION DATE	:	DECEMBER 2019 / JANUARY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTION ONLY

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THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

Q1 (a) Describe stress.

(3 marks)

(b) Determine the deformation of the steel road shown in **Figure Q1(b)** under the given loads. (E=200 GPa)

(5 marks)

(c) Determine the reactions at A and C for the steel bar and loading shown in **Figure Q1(c),** assuming a close fit at both supports before the loads are applied.

(12 marks)

Q2 (a) State and sketch **four (4)** classifications of beams

(8 marks)

(b) A beam AB 10m long has supports at its ends A and B. It carries a point load of 2.5 kN at 3m from A and a point load of 2.5 kN at 7m from A and a uniformly distributed load of 0.5 kN/m between the point loads. Draw the shearing force and bending moment diagrams for the beam.

(12 marks)

Q3 (a) Give **two (2)** examples of composite beam.

(2 marks)

(b) Determine the location of the centroid of the plane as shown in **Figure Q3(b)**

(4 marks)

(c) A cross- sectional area of the beam is shown in **Figure Q3(c)**. If the limiting bending for the material of the beam are 160 MPa in torsion and 80 MPa in compression. Find length of the beam, L if the beam is simply supported at both ends with uniform distributed load along the beam of 3 kN/m.

(14 marks)

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Q4 (a) What is torsion and give **three (3)** examples of assumption to determining the relationship of the shearing stress in circular shaft subjected to torsions.

(4 marks)

(b) Refer to **Figure Q4(b)**, knowing that the internal diameter of the hollow shaft shown is $d = 23$ mm, determine the maximum shearing stress caused by a torque of magnitude $T = 1.0$ kNm.

(6 marks)

(c) A solid circular shaft transmits 75kN at 200rpm. Calculate the shaft diameter, if the twist in the shaft is not to exceed 1° in 22 meters length of shaft and the shear stress is limited to 50 MPa. Take G = 100 GPa

(10 marks)

Q5 (a) Briefly explain the definition of thin cylinder.

(2 marks)

(b) A boiler of 600 mm diameter is built of steel plate. If a 4 MPa inner pressure is applied to the boiler, calculate the thickness of the steel plate. Given the maximum longitudinal stress is 400 MPa.

(4 marks)

(c) A boiler with 2 m diameter and 2 m long constructed from 10 mm thick steel plate is subjected to an internal pressure MPa. If the Modulus of Elasticity 200 GPa, and Poisson ratio of 0.3. Determine;

(i) The change in the diameter

(5 marks)

(ii) The change in the length

(5 marks)

(iii) The change in the volume

(4 marks)

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Q6 (a) Give two (2) methods to compute principal stresses..

(2 marks)

(b) The state of plane stress at a point on a body is shown on the element in the **Figure Q6(b)**. Draw the Mohr's Circle for the state of plane loaded. And determine :

(i). The principle plane angle

(6 marks)

(ii). The Principle stress

(6 marks)

(iii). The maximum shearing stress

(6 marks)

- END OF QUESTION -

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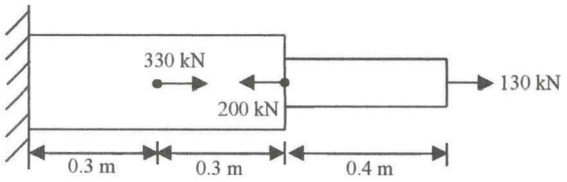

Figure Q1(b)

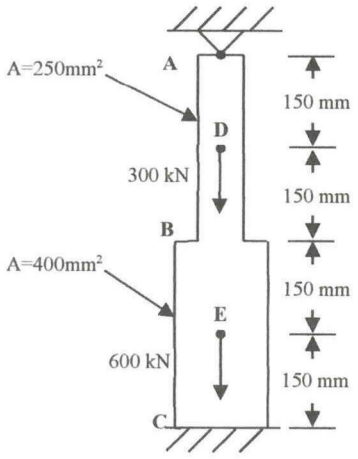

Figure Q1(c)

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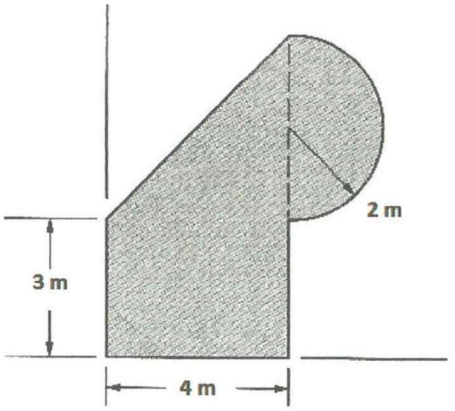

Figure Q3(b)

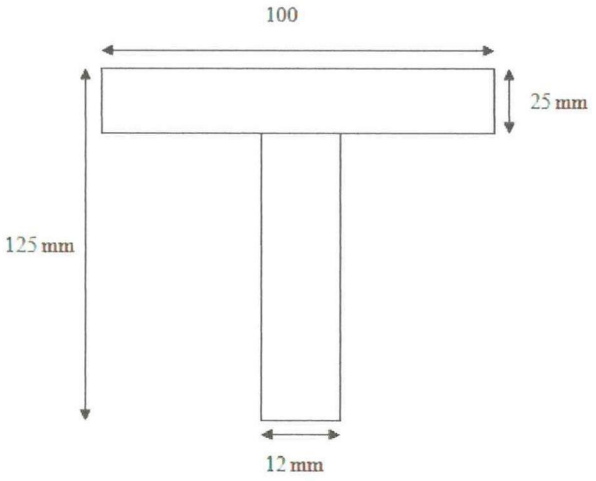

Figure Q3(c)

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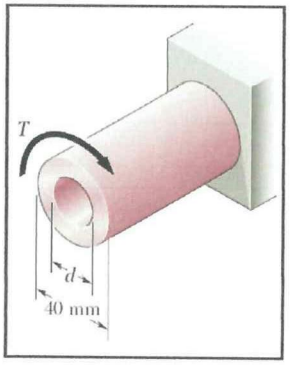

Figure Q4(b)

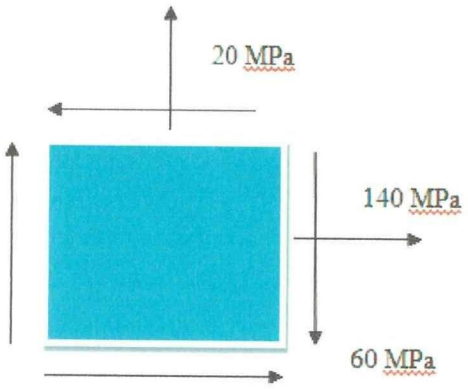

Figure Q6(b)

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