



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2016/2017**

COURSE NAME : SOLID MECHANICS
COURSE CODE : DAJ31903
PROGRAMME : DAJ
EXAMINATION DATE : DECEMBER 2016 / JANUARY 2017
DURATION : 2 HOURS 30 MINUTES
INSTRUCTION : ANSWER **FIVE (5)** QUESTIONS ONLY

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THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) Explain briefly the meaning of the following terms:

- 1) Strees
- 2) Strain

(4 Mark)

(b) A hollow cylinder 2m long has an outside diameterof 50mm and inside diameter of 30mm. If the cylinder is carrying a load of 25kN, find the stress in the cylinder. Also find the deformation of the cylinder if the value of modulus of elasticity for the cylinder material is 100Gpa.

(16 Mark)

Q2 (a) Give **three (3)** example of load with figure.

(6 Mark)

(b) A cantilever beam AB, 5m long is loaded as shown in **Figure Q2(b)**. Construct the shear force and bending moment diagram and find the position and value of maximum bending moment.

(14 Mark)

Q3 (a) Explain briefly the meaning of the following terms:

- 1) Center of Gravity
- 2) centroid

(4 Mark)

(b) A steel wire of 5mm diameter is bent into circular shape of 5m radius. Determine the maximum stress induced in the wire. Take $E = 200\text{GPa}$.

(6 Mark)

A cross- sectional area of the beam is shown in **Figure Q3 (b)**. 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.

(10 Mark)

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- Q4 (a) List **three (3)** examples of assumption to determine the relationship of the shearing stress in circular shaft subjected to torsions.

(3 Mark)

A solid steel shaft is to transmit a torque of 10kN-m. If the shearing stress is not exceed 45MPa, find the minimum diameter of the shaft

(5 Mark)

- (b) A solid shaft of 120mm diameter is required to transmit 200kW at 100 rpm. If the angle of twist not to exceed 2° , find the length of the shaft. Take modulus of rigidity for the shaft material as 90GPa.

(12 Mark)

- Q5 (a) List **three (3)** examples of cylindrical pressure vessel.

(3 Mark)

A boiler of 800mm diameter is made up of 10mm thickness plates. If the boiler is subjected to an internal pressure of 2.5MPa, find the circumferential and longitudinal stresses induced in the boiler plate.

(5 Mark)

- (b) A cylindrical shell 3m long has 1m internal diameter and 15mm metal thickness. Calculate the circumferential and longitudinal stresses, if the shell is subjected to an internal pressure of 1.5MPa. Also calculate the changes in diameter, length and volume of the shell. Take $E = 200\text{GPa}$ and Poisson's ratio = 0.3.

(12 Mark)

- Q6 (a) Explain the procedures for analysis, if state of stress at a point is known for a given orientation of an element of material.

(8 Mark)

- (b) The state of plane stress at a point is shown on the element in **Figure Q6 (b)**. Determine the maximum in-plane shear stress and the orientation of the element at this point..

(12 Mark)

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-END OF QUESTION-

PEPERIKSAAN AKHIR

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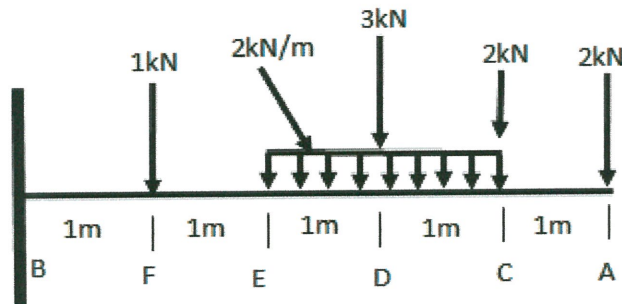
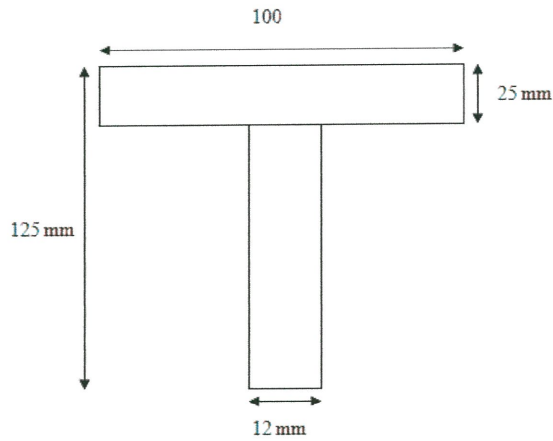


Figure Q2(b)



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Figure Q3(b)

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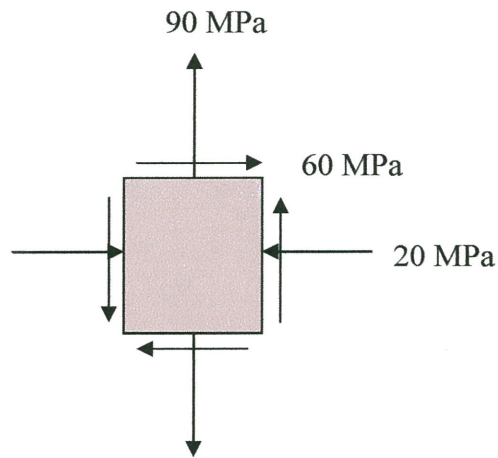


Figure Q6(b)

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