Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2015/2016

COURSE NAME	:	SOLID MECHANICS
COURSE CODE	:	DAM 21003
PROGRAMMECODE	:	DAM
EXAMINATION DATE	:	JUNE / JULY2016
DURATION	:	3HOURS
INSTRUCTION	:	ANSWERS FIVE (5) QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) Define and explain the relationship between stress and strain.

(4 marks)

(b) For the bars shown in **Figure Q1 (b)**, determine:

(i) The compressive force in the bars after a temperature rise of 69 degree celcius.
(ii) The corresponding change in length of the bronze bar.

(16 marks)

Q2 (a) What is the difference between bending moment and shear force diagram

(6 marks)

(b) A beam AB 20 meters long, carries a uniformly distributed load 0.6 kN/m together with concentrated load of 3 kN at left hand end A and 5 kN at right hand end B as shown in **Figure Q2 (b).**

(i) Draw shear force and bending moment diagrams
(ii) Determine the location and magnitude of the maximum value of the bending moment.

(14 marks)

Q3 (a) Explain in diagram the stress variation across beam section when it is subjected to a positive bending moment.

(4 marks)

(b) **Figure Q3 (b)** shows the T shape of a brass beam with 4 m length is subjected to a concentrated load 7 kN on the middle beam at point B. By neglecting the fillets effect,

(i) Calculate the centroid of section
(ii) Calculate the moment inertia of section refer on neutral axis
(iii) Determinte the maximum tensile and compressive stresses.

(16 marks)

Q4 (a) Define the term of torsion.

(2 marks)

(b) A hollow shaft is to transmit 200 kW at 80 r.p.m. If the shear stress is not to exceed 60 MPa and ratio of internal diameter is 0.6 of the external diameter, find the internal and external diameter of the shaft.

(10 marks)

(c) Refer to **Figure Q4 (c)** knowing that each portion of the shaft AD consists of a solid circular rod, determine the maximum stress in shaft BC.

(8 marks)

Q5 (a) Give **Three (3)** example of cylindrical pressure vissel.

(3 marks)

(b) A boiler of 500 mm diameter is built of steel plate. If a 4 MPa pressure is applied to the boiler, calculate the thickness of the steel plate. Given the maximum longitudinal stress is 400 MPa.

(5 marks)

(c) A boiler with 500 mm diameter and 5 m long constructed from 4mm thick steel plate is subjected to an internal pressure 6 MPa. If the Modulus of Elasticity 200 GPa, and Poisson ratio of 0.3. Determine;

(i) the change in the diameter
(ii) the change in the length
(iii) the change in the volume

(12 marks)

Q6 (a) For the state of plane that shown in **Figure 6**, determine:

(i) the principal planes
(ii) the principal stress
(iii) the maximum shearing stress

(20 marks)

-END OF QUESTIONS –

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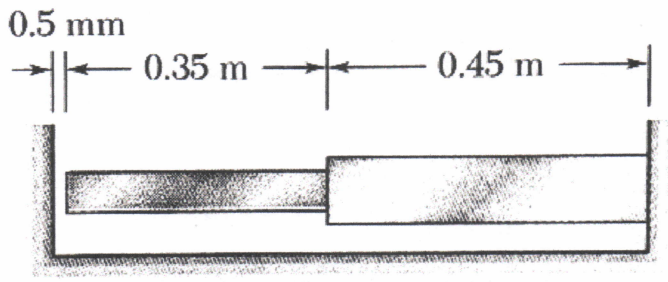

Bronze	Aluminum
$A = 1500\ \text{mm}^2$	$A = 1800\ \text{mm}^2$
$E = 105\ \text{GPa}$	$E = 73\ \text{GPa}$
$\alpha = 21.6 \times 10^{-6}/°\text{C}$	$\alpha = 23.2 \times 10^{-6}/°\text{C}$

Figure Q1 (b)

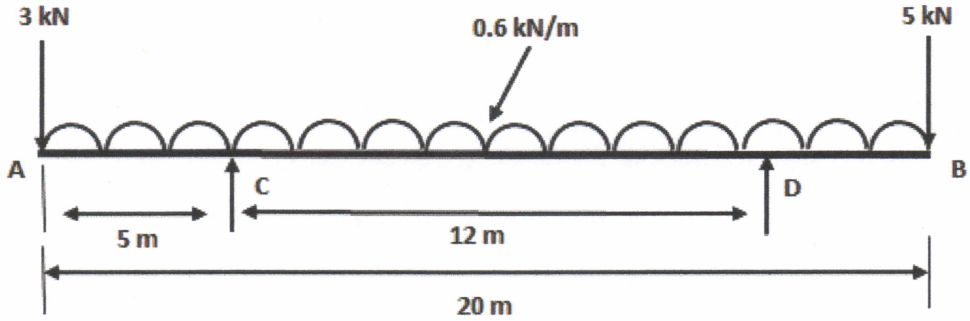

Figure Q2 (b)

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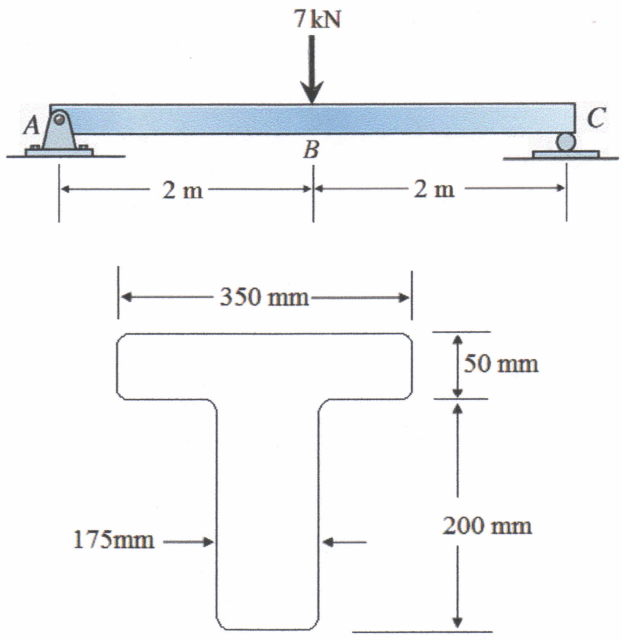

Figure Q3 (b)

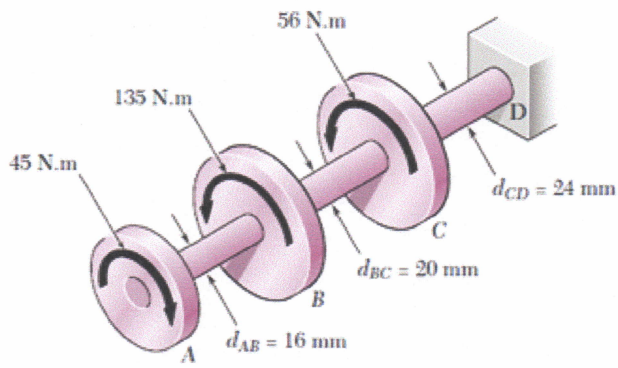

Figure Q4(c)

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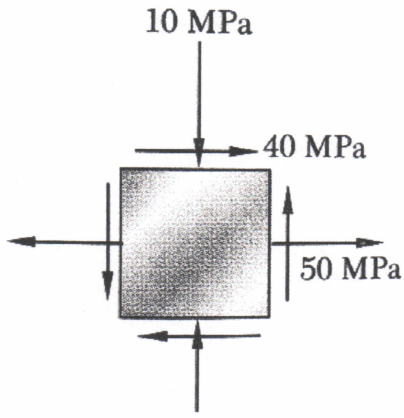

Figure Q6