



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2017/2018**

COURSE NAME : SOLID MECHANICS  
COURSE CODE : DAJ 31903  
PROGRAMME CODE : DAJ  
EXAMINATION DATE : JUNE/ JULY 2018  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER FIVE (5) QUESTIONS ONLY

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THIS QUESTION PAPER CONSISTS OF SIX (6) PAGES

- Q1** (a) Describe point load and distributed load with the aid of sketch. (6 marks)
- (b) Determine the deformation of the steel rod shown in **Figure Q1 (b)** under the given loads. (Given,  $E= 200 \text{ GPa}$ ,  $A_1=A_2= 0.6 \times 10^{-3} \text{ m}^2$ ,  $A_3= 0.2 \times 10^{-3} \text{ m}^2$ ). (14 marks)
- Q2** (a) State and describe **four (4)** classifications of beams (6 marks)
- (b) Draw the shear and bending-moment diagrams for the beam and loading shown in **Figure Q2 (b)**, and determine:
- (i) The maximum absolute value of the shear (7 marks)
- (ii) The maximum absolute value of the bending moment (7 marks)
- Q3** (a) Explain in diagram the stress variation across beam section when it is subjected to a positive bending moment. (4 marks)
- (b) The simply supported beam in **Figure 3(b)(i)** has the cross sectional area shown in **Figure 3(b)(ii)**. Determine the absolute maximum bending stress in the beam and draw the stress distribution over the cross section at this location. (16 marks)

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- 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 the ratio of internal diameter and external diameter is 0.6, calculate the internal and external diameter of the shaft. (8 marks)
- (c) **Figure Q4(c)** shows the internal diameter of the hollow shaft is  $d_i = 40$  mm and outer diameter is  $d_o = 60$  mm. Determine the torque,  $T$  which causes a maximum shearing stress of 52 MPa. (10 marks)
- Q5** (a) State **three (3)** examples of cylindrical pressure vessel. (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 4 mm 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. (4 marks)
- (ii) The change in the length. (4 marks)
- (iii) The change in the volume. (4 marks)
- Q6** (a) Name **two (2)** components of the general state of stress act at a point. (2 marks)
- (b) For the state of plane that shown in **Figure 6(b)**, determine:
- (i) The principal planes. (6 marks)
- (ii) The principal stress. (6 marks)
- (iii) The maximum shearing stress. (6 marks)

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-END OF QUESTIONS -

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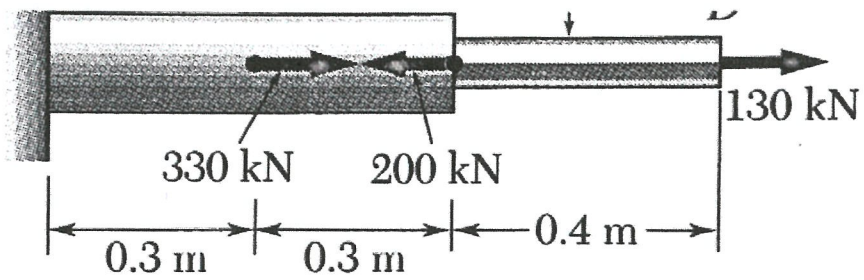


Figure Q1(b)

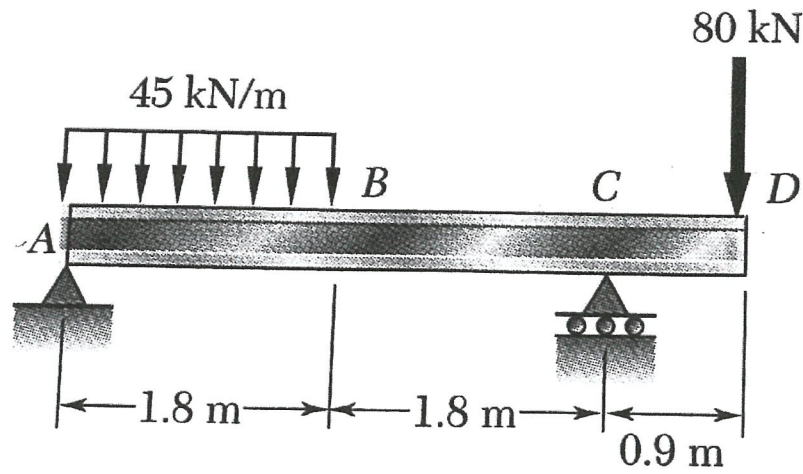
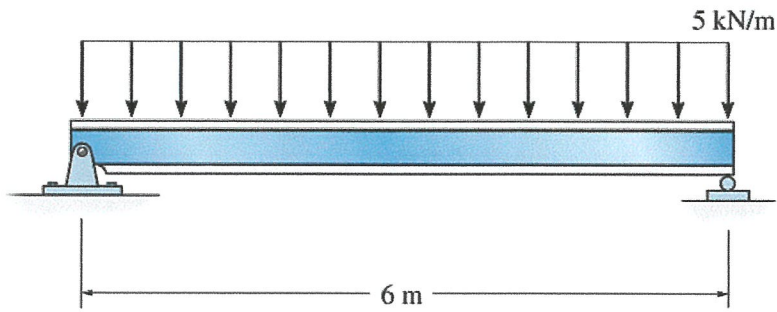


Figure Q2(b)

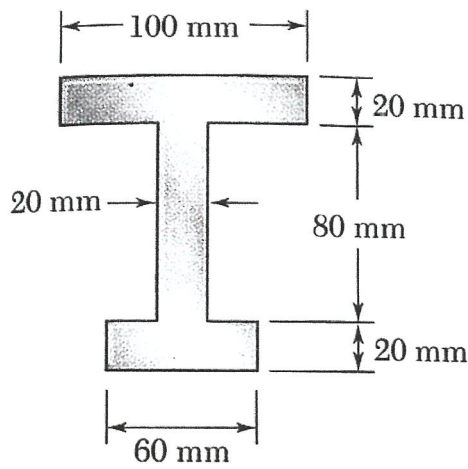
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**Figure Q3 (b) (i)**



**Figure Q3 (b) (ii)**

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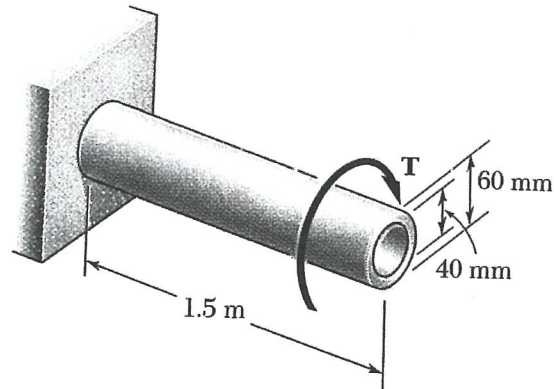


Figure Q4(c)

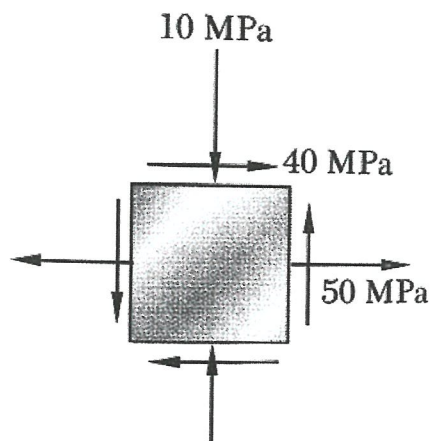


Figure Q6(b)

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