Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2013/2014

COURSE NAME	:	MECHANICS OF MATERIAL
COURSE CODE	:	BFC 20903/BFC2083
PROGRAMME	:	2 BFF
EXAMINATION DATE	:	DECEMBER 2013/JANUARY 2014
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FOUR (4)** QUESTIONS ONLY

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

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Q1 (a) What is the definition of bearing stress, shear stress and normal stress?
(6 marks)

(b) Two solid cylindrical rods are joined at B and loaded as shown in Figure **Q1.** Rod AB is made of brass with E = 105 GPa, and rod BC of steel with E = 200 GPa. Determine the total horizontal deformation of the composite rod ABC.
(5 marks)

(c) A Mohr's Circle has the radius 58.2 MPa and average stress 28.3 MPa, respectively. Using Mohr's Circle Method, determine:

(i) Principal stress
(5 marks)

(ii) Normal and shear stress at $\theta = 0^\circ$ if the principal plane is 32° clockwise
(3 marks)

(iii) The stress component exerted on the element obtained by rotating the given element at $\theta = 25^\circ$ counterclockwise
(3 marks)

(iv) Maximum shear stress and the orientation of the planes
(3 marks)

Q2 An inverted T beam is loaded with point loads as shown in Figure Q**2.** Find:

(a) Reaction at supports.
(2 marks)

(b) Draw shear force diagram (SFD) and bending moment diagram (BMD).
(5 marks)

(c) Centroid of the beam.
(3 marks)

(d) Moment inertia of the beam.
(5 marks)

(e) Maximum tensile and compression stress of the section.
(tips: maximum stress (tensile/compression) is either occurs at top or bottom of the beam)
(10 marks)

Q3 (a) List **Three (3)** factors affect deflection of beam?

(3 marks)

(b) Figure **Q3** shows a beam ABC carrying a point load P at C. Consider the stiffness = EI.

(i) Calculate the reactions of the beam

(2 marks)

(ii) Sketch the elastic curve of the beam

(2 marks)

(iii) Obtain the equation of slope and deflection curve using double integration method

(15 marks)

(iv) Determine the deflection at C

(3 marks)

Q4 (a) Using Method of Joint, determine the internal force for each member of trusses as shown in Figure **Q4(a).**

(15 marks)

(b) Figure **Q4(b)** shows a trusses supported with pinned support at point A and roller at point B. Using Method of Section, determine the internal force for member EF, CD, DF and DE.

(10 marks)

Q5 (a) State **Five (5)** assumptions in Euler theory.

(5 marks)

(b) Column *ABC* has a uniform rectangular cross section with $b = 12$ mm and $d = 22$ mm. The column is braced in the *xz* plane at its midpoint *C* and carries a centric load **P** of magnitude 3.8 kN as given in Figure **Q5(a)**. Knowing that a factor of safety of 3.2 is required, determine the largest allowable length *L*. Use $E = 200$ GPa.

(10 marks)

(c) The torques shown in Figure **Q5 (b)** are exerted on pulleys *A* and *B*. Knowing that both shafts are solid, determine the maximum shearing stress in shaft *AB* and *BC*.

(10 marks)

-END OF QUESTION-

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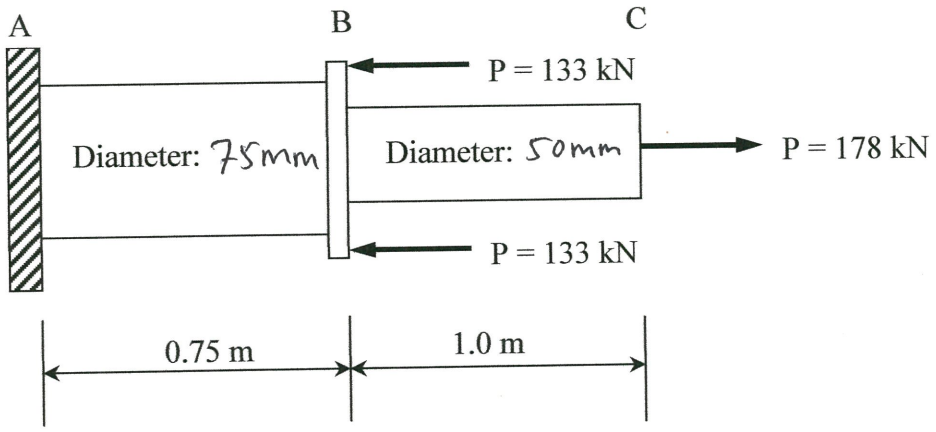

FIGURE Q1

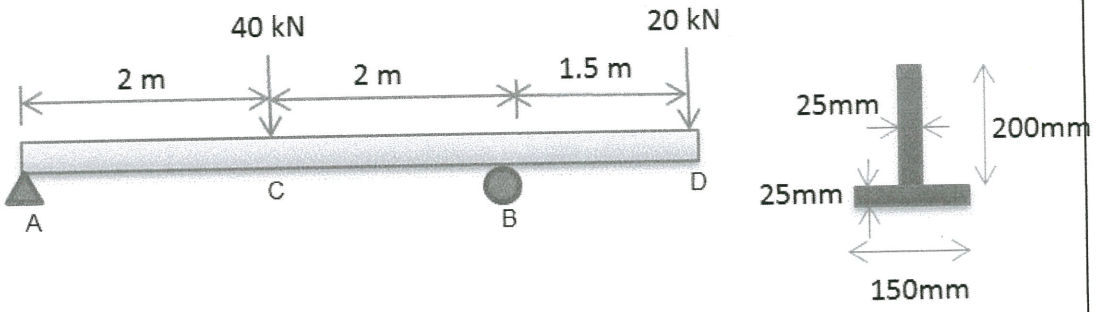

FIGURE Q2

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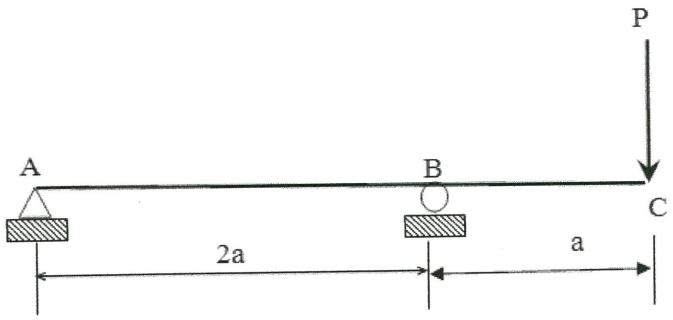

FIGURE Q3

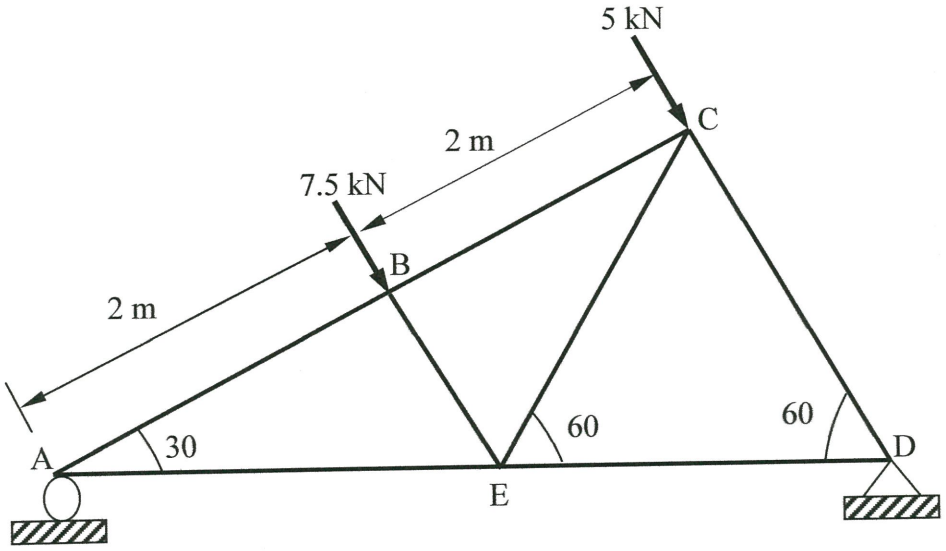

FIGURE Q4 (a)

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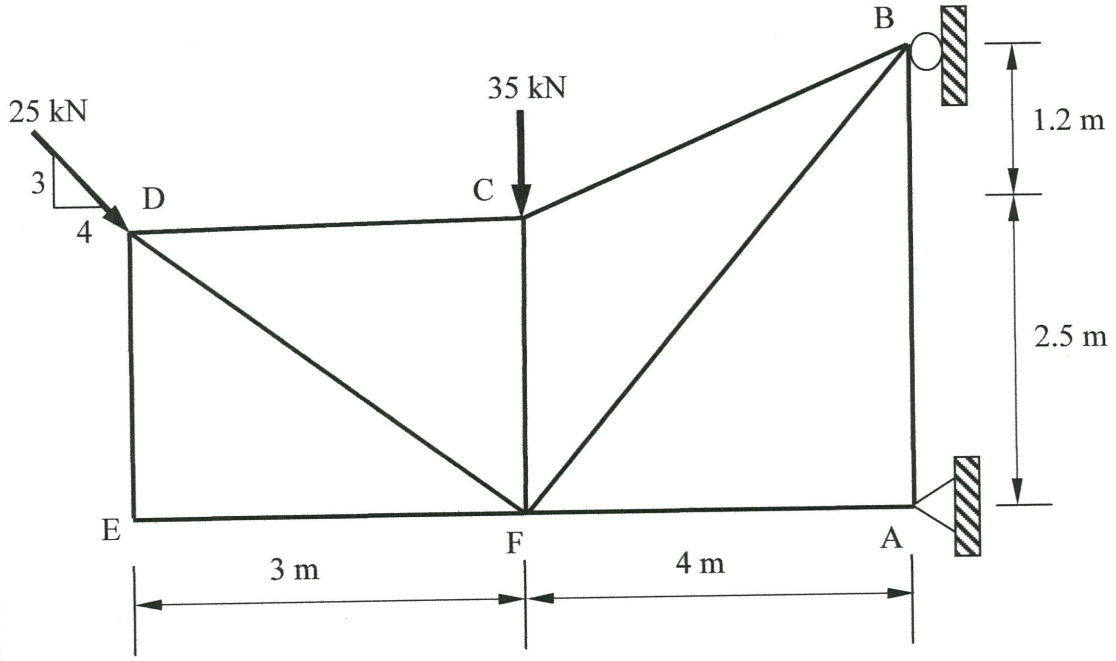

FIGURE Q4(b)

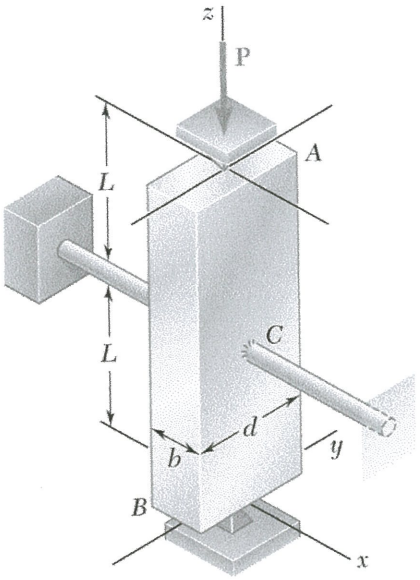

FIGURE Q5(a)

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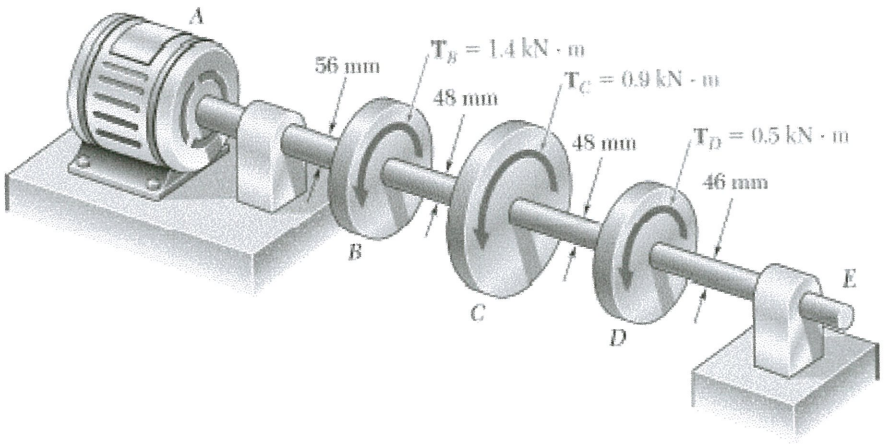

FIGURE Q5(b)

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