UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER I
SESSION 2020/2021

COURSE NAME	:	SOLID MECHANICS
COURSE CODE	:	BBM 30303
PROGRAM CODE	:	BBA / BBD / BBG
DATE	:	JANUARY / FEBRUARY 2021
DURATION	:	3 HOURS
INSTRUCTION	:	(1) ANSWER **ALL** QUESTIONS. (2) MANUALLY WRITTEN ANSWERS ONLY (3) FOLLOW THE GIVEN ELECTRONIC SUBMISSION INSTRUCTIONS

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

Q1 (a) Figure Q1(a) shows a shaft that is supported by a smooth thrust bearing at A and a smooth journal bearing at B. Determine the resultant internal loading acting on the cross section at C.

(10 marks)

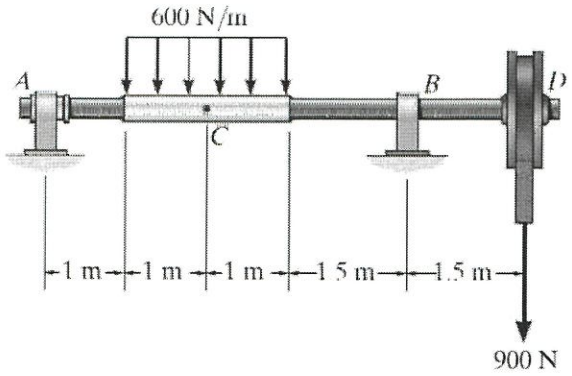

Figure Q1(a)

(b) Figure Q1(b) indicates part of a control linkage for an airplane that consists of a rigid member CBD and a flexible cable AB. If a force is applied to the end D of the member and causes it to rotate by $\theta = 0.3°$, determine the normal strain in the cable. Assume that the cable is unstreatched in its original state.

(10 marks)

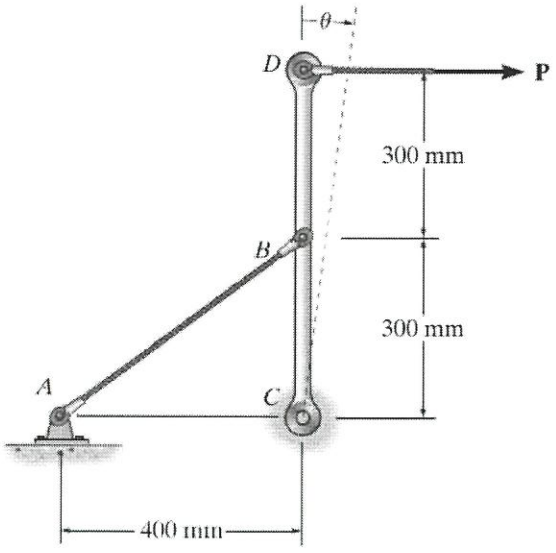

Figure Q1(b)

Q2 The column shown in Figure Q2 is constructed from high-strength concrete (E_c = 25 GPa) and four A-36 steel (E_{st} = 200 GPa) reinforcing rods. If it is subjected to an axial force of 800 kN, determine the required diameter of each rod so that one-fourth of the load is carried by the steel and three-fourths by the concrete.

(20 marks)

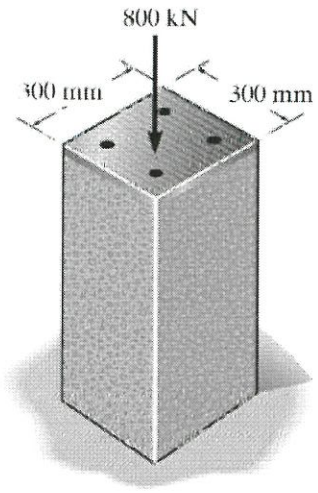

Figure Q2

Q3 The 60-mm-diameter shaft in Figure Q3 is made of 6061-T6 aluminium (G = 26 GPa). If the allowable shear stress is τ_{allow} = 80 Mpa, and the angle of twist of disk A relative to disk C is limited so that it does not exceed 0.06 rad, determine the maximum allowable torque T.

(20 marks)

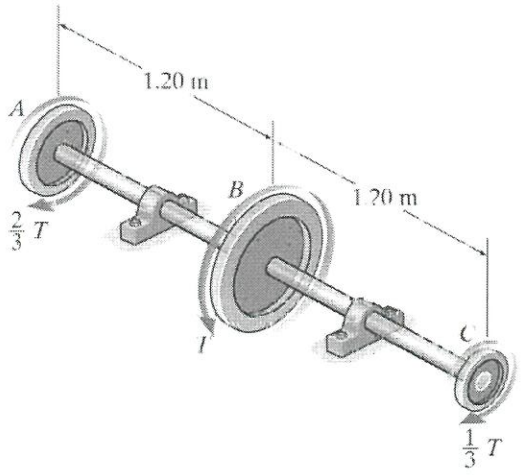

Figure Q3

Q4 For the beam shown in Figure Q4, express the internal shear and moment in terms of x and then draw the shear and moment diagrams for the beam.

(20 marks)

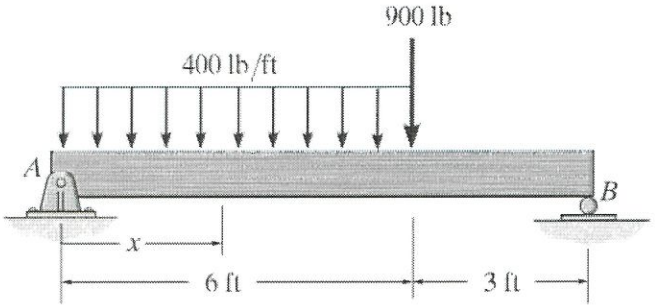

Figure Q4

Q5 (a) The tank of the air compressor in Figure Q5(a) is subjected to an internal pressure of 90 psi. If the internal diameter of the tank is 22 in., and the wall thickness is 0.25 in., determine the stress components acting at point A. Draw a volume element of the material at this point, and show the results on the element.

(6 marks)

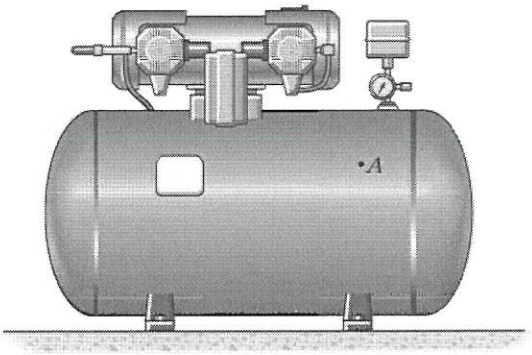

Figure Q5(a)

Q5 (b) For the element shown in Figure Q5(b), determine the equivalent state of stress on an element at the same point oriented 60° clockwise with respect to the element shown. Sketch the results on the element.

(14 marks)

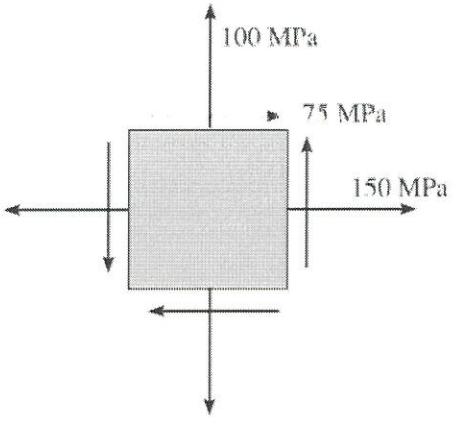

Figure Q5(b)

-END OF QUESTIONS-