

Any data missing may be assumed

MAXIMUM CREDIT = 85 POINTS

Question 1: 28(10+8+10) points

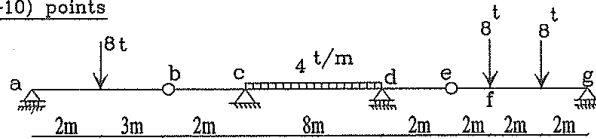


Fig.(1)

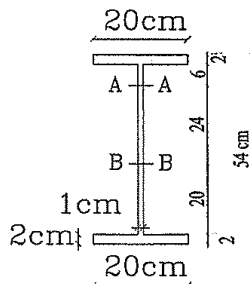


Fig.(1a)

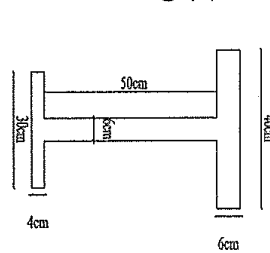


Fig.(1b)

dimensions are measured from center lines

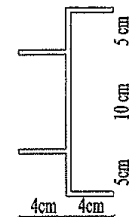


Fig.(1c)

All plate thickness = 2 cm

- 1-If the beam shown in Fig.(1), has the cross-section shown in Fig.(1a), draw the shear stress distribution at support a and then, compute the shear forces that carries by the part of cross-section between parts A-A and B-B.
- 2-If the beam shown in Fig.(1), has the cross-section shown in Fig.(1b), for section of beam cd, find the location of shear center at mid span cd.
- 3-If the beam shown in Fig.(1), has the section given in Fig.(1c) at point f, draw the shear distribution and find the location of shear center.

Question 2: 18(7+7+4) points

- 1-For the eccentric connection shown in Fig.(2b), name the rivet having the maximum force and other having minimum force and then compute these forces.
- 2-If the frame shown in Fig.(2), has the cross-section shown in Fig.(2a), specify the spacing between the rivets necessary to fasten all parts together at section c. Diameter of rivets 20 mm and resistance for each each rivet = 4 t.
- 3-If any beam has a rectangular cross section with width of 30 cm and depth of 60 cm with maximum shear stress of 400 kg/cm<sup>2</sup>, find the shear force Q.

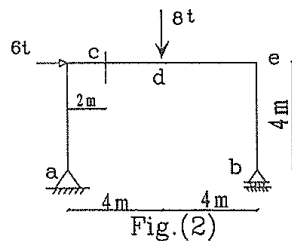
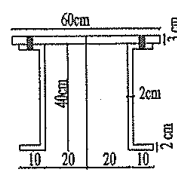


Fig.(2)



all dimensions are in cm

Fig.(2a)

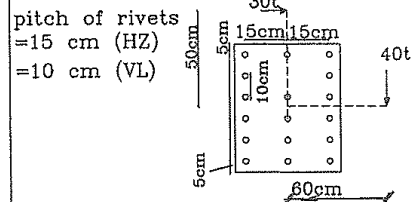


Fig.(2b)

Question 3: 12(7+5) points

1-Find the weight ratio of hollow shaft with a 60 cm diameter solid one, if the two sections have the same shear stress.

For the hollow section take the inner diameter equals 0.8 of outer diameter.

2-For stresses shown in Fig.(3), compute the principal normal and principal shear stresses .

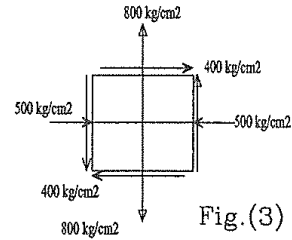


Fig. (3)

Question 4: 10 points

All rivets have pitch of 10 cm and edge distance of 5 cm.

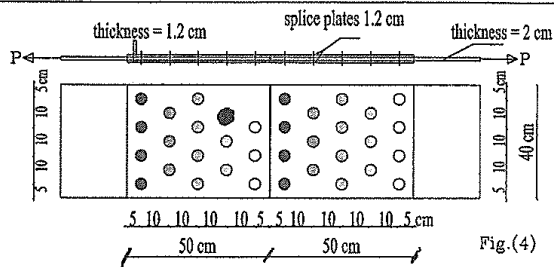


Fig. (4)

Compute the safe load P can applied to the riveted connection shown in Fig.(4), to satisfy allowable stress in steel plates.

All rivets have 2-cm diameters.

All shear stress in rivets = 0.96 t/cm.

Allowable tension stress in steel plates = 1.6 t/cm.

Allowable bearing stress in steel plates = 1.6 t/cm.

Question 5: 12 points

For beam shown in Fig.(5),

Derive the rotation and deflection expressions using double integration method.

Then, compute the deflection at point C

and rotation at support B.

EI is constant = 5000 t.m<sup>2</sup>

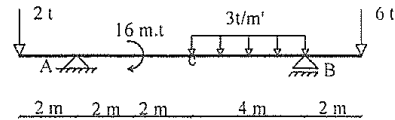
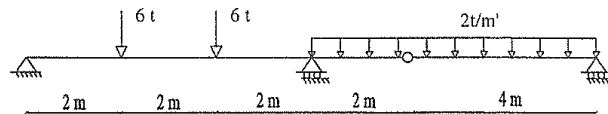


Fig. (5)

Question 6: 12 Points

Fig. (6)



For beam shown in Fig.(6), using the conjugate beam method, draw the elastic line.

EI is constant = 5000 t.m<sup>2</sup>

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