University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2012
Program: B.Sc. Engineering (Civil)

Course Code: CE 211 Course Title: Mechanics of Solids I
Full Marks: 100 (=10×10) Time: 3 hrs

*There are **FOURTEEN (14)** questions in this paper. Answer any **TEN (10).***
Assume any missing data reasonably.

1. Draw axial force, shear force and bending moment diagram for the beam with loads as shown In Fig. 1 (10)

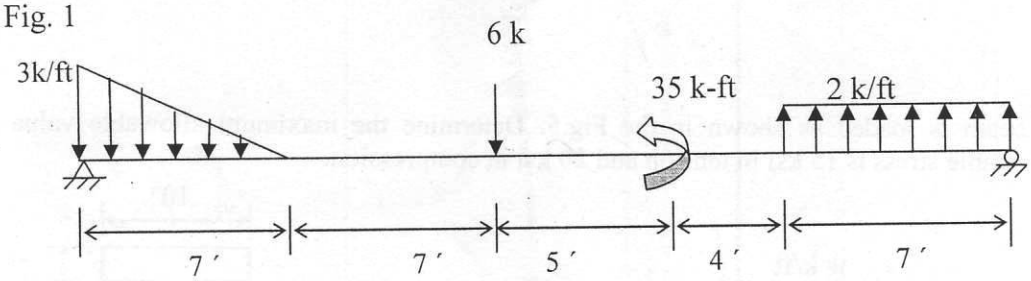


Fig. 1

2. Draw the S.F.D and B.M.D of the Beam as shown in Fig.2 using summation method. Provide brief calculation (10)

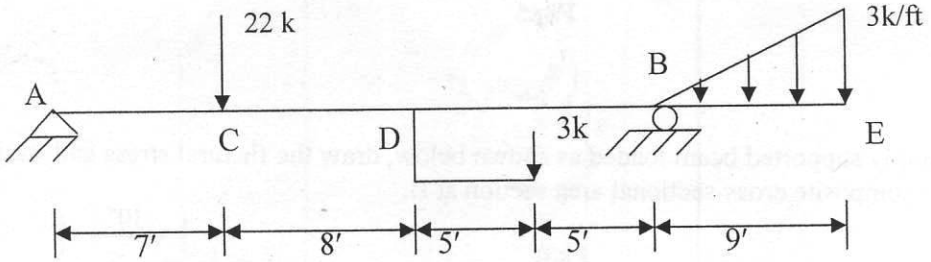


Fig. 2

3. Using singularity function to determine the expressions of shear force and bending moment for the beam loaded as shown in Fig.3. Hence draw shear force and bending moment diagram for the beam. (10)

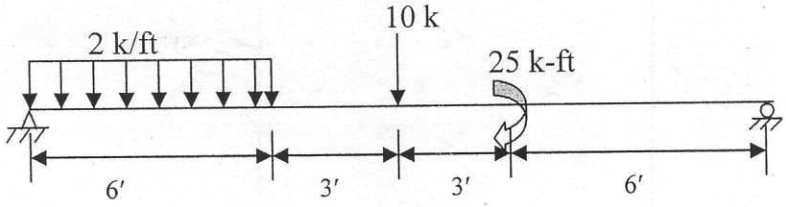


Fig.3

4. Draw the shear force and bending moment diagrams for the structure shown in Fig 4. (10)

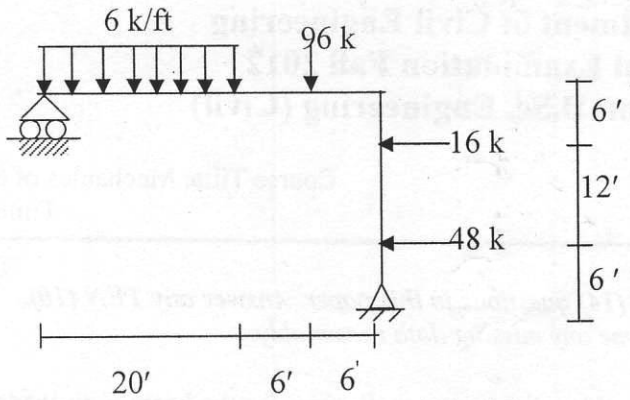
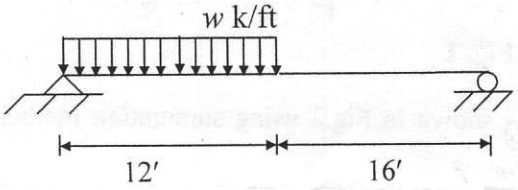


Fig.4

5. A beam is loaded as shown in the Fig.5. Determine the maximum allowable value of w if allowable stress is 15 ksi in tension and 20 ksi in compression. (10)



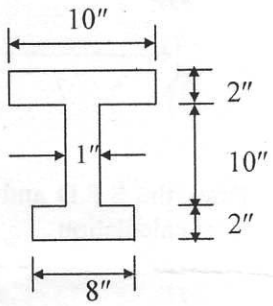
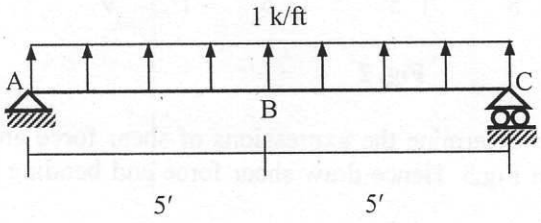
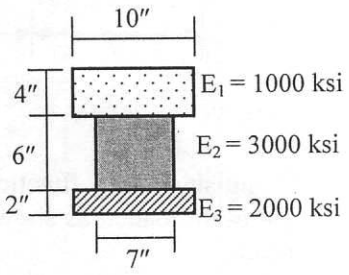


Fig.5

6. For a simply supported beam loaded as shown below, draw the flexural stress and strain diagrams over the composite cross-sectional area section at B. (10)





Cross Section at B

7. A steel beam is loaded as shown in Fig.7. Calculate shearing stress at levels indicated at section A-A. Also draw the shear stress distribution diagram. (10)

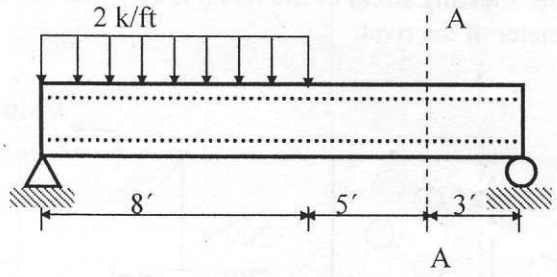
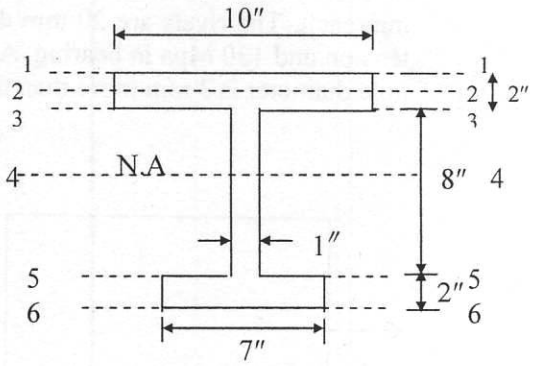


Fig 7



Section A-A

8. A L-3″×3″×0.5″ angle (Fig.8), which is to be welded to a gusset plate carries a load of 90 kips to a gusset plate along its centroidal axis. (10)

(a) Determine the lengths of a side fillet welds required at the heel and toe of the angle for a non-eccentric connection. Assume that the allowable shearing stress through the throat of each weld is 21 ksi (i.e F_v= 21 ksi)

(b) Resolve question (a) assuming that a fillet weld of maximum permissible size is added along the entire length of the end of the angle.
Use 5/16″ fillet weld.

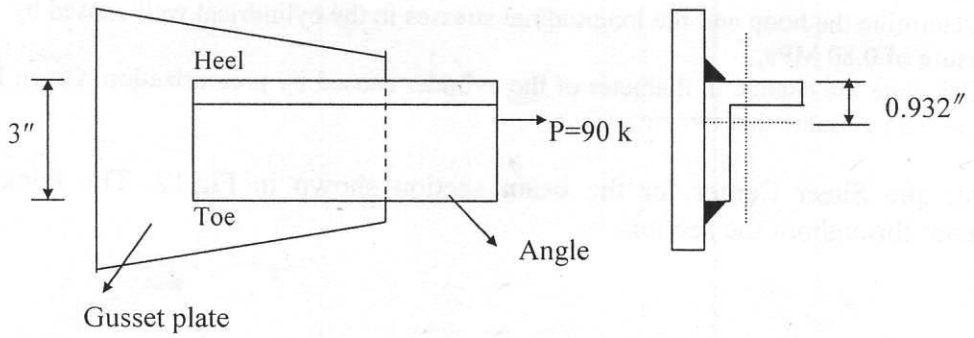


Fig.8

9. Define (a) Modulus of Elasticity (b) Modulus of Resilience(c) Poisson's Ratio (d) Yield Strength (e) Modulus of Toughness(f) Ductility (10)

10. Determine the safe capacity of the double-riveted butt joint shown in Fig.10 and hence the efficiency of the joint. The thickness of the main plate is 16 mm and that of cover plate is 10 mm each. The rivets are 20 mm diameter. The allowable stresses of the plates are 100 Mpa in tension and 130 Mpa in bearing. Allowable shearing stress of the rivets is 70 MPa. Assume rivet hole diameter is 3 mm more than the diameter of the rivet. (10)

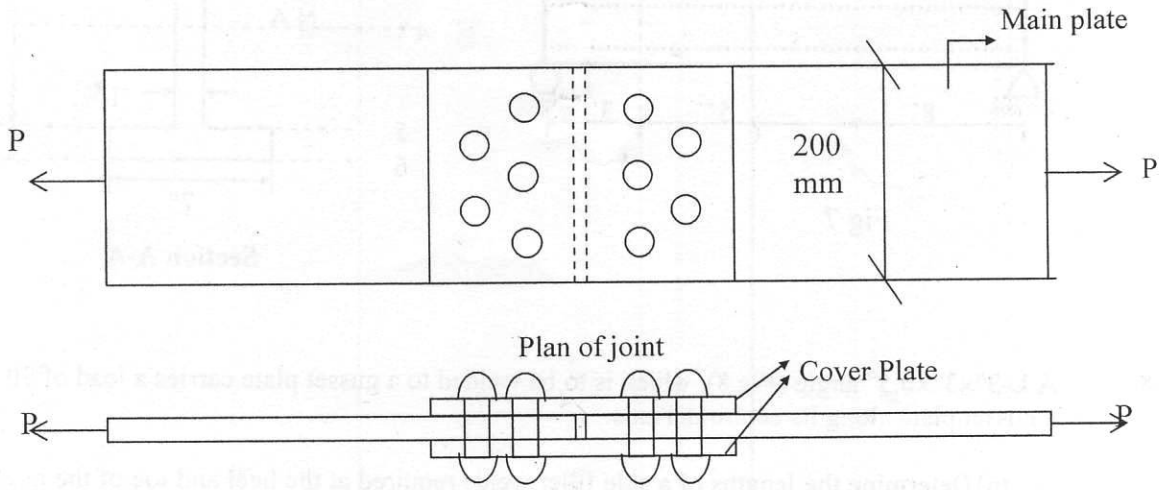


Fig. 10

11. Consider a closed cylindrical steel pressure vessel. The radius of the cylinder is 1000mm and its wall thickness is 10mm. (10)
(a)Determine the hoop and the longitudinal stresses in the cylindrical wall caused by an internal pressure of 0.80 MPa.
(b)Calculate the change in diameter of the cylinder caused by pressurization. Given E=200GPa and υ=0.25.Assume that $r_i=r_o=r$.

12. Locate the Shear Center for the beam section shown in Fig.12. The thickness, t is constant throughout the section. (10)

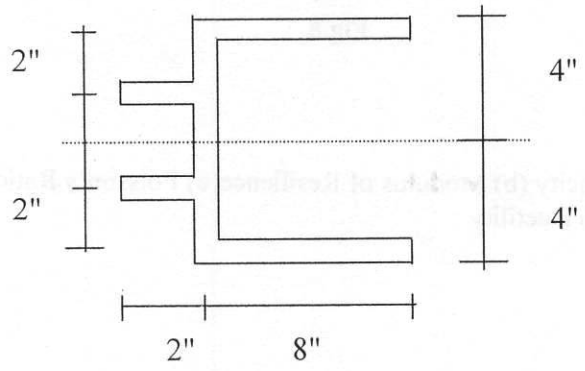


Fig.12