Civil

COLLEGE OF ENGINEERING PUNE
END-SEM: 2012-2013 (I SEM)
Matrix Analysis of Structures (CE-437)

Programme : B. Tech. (Civil) Date: 01-12-2012
Duration: 180 minutes Max. Marks: 50
Time: 2-00 pm to 5-00 pm

Instructions :

1) **Answer all questions.**
2) **Figures to the right indicate full marks.**
3) **Use of non-programmable calculator is not allowed.**
4) **Use member approach for solving problems.**

Q.1 For the beam loaded as shown in Fig. 1, span 1-2 has a temperature differential applied to it such that the temperature of its lower surface is 50^0 higher than that of its upper surface. Depth of the beam is 0.16 m and $\alpha = 11\times10^{-6}/\,^0C$. Determine the member end actions for both the members. $EI = 50\ MNm^2$ (10)

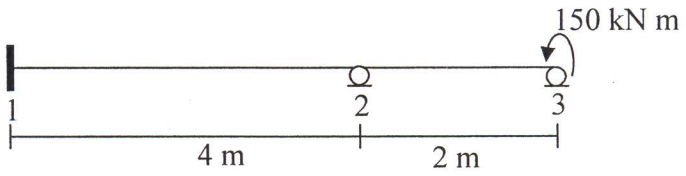


Fig. 1

Q.2 For the plane truss shown in Fig. 2, calculate the forces in all the members if fabricated length of member 3 is 3 mm short. The cross sectional area of each member is 5000 mm^2. Young's modulus E for all members is 200 GPa. Neglect the self weight of the members. (10)

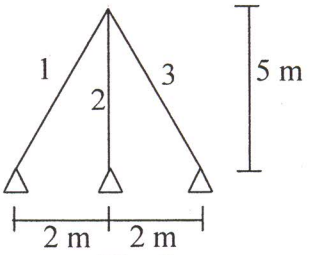
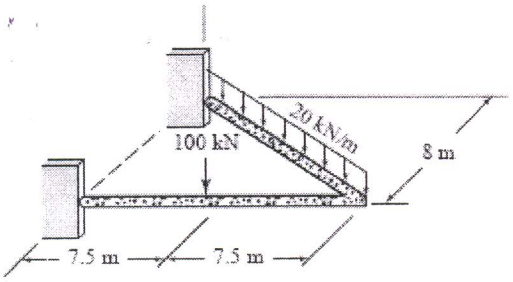


Fig. 2

Q.3 For the grid shown in Fig. 3 determine the member end actions for both the members. (10)



E, G, I, J = constant
$E = 30$ GPa
$G = 12.5$ GPa
$I = 4.8(10^9)\ mm^4$
$J = 3.2(10^9)\ mm^4$

Fig. 3

Q.4 For the space truss shown in Fig. 4, determine the forces in all the members. (15)
AE = 400 MN for all the members. Point 1 is equispaced from points 2, 3, 4 and 5.

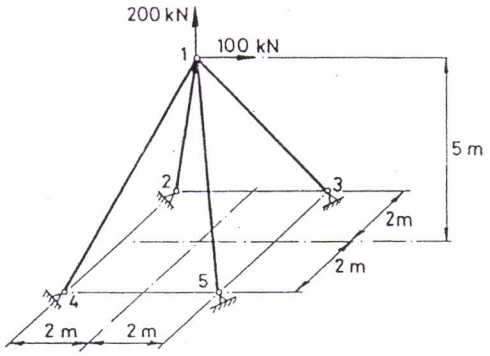


Fig. 4

Q.5 For the space frame shown in Fig. 5, write the member stiffness matrix for member parallel to the X axis. (5)

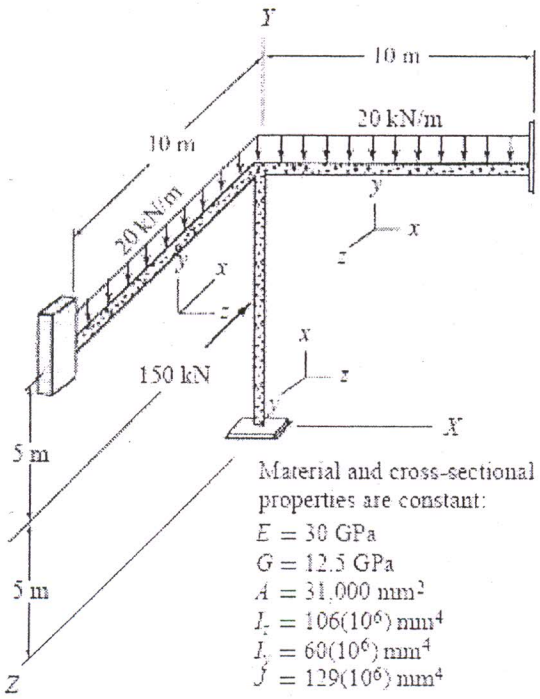


Fig. 5