Total No. of Questions : 8] SEAT No. :

P1948 [Total No. of Pages : 4

[5059]-509
B.E. (Civil Engineering)
MATRIX METHODS OF STRUCTURAL ANALYSIS
(2012 Pattern) (Elective - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:-

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Solve the following system by Gauss-Jordan Method **[6]**

$x + y + z = 5$

$2x + 3y + 5z = 8$

$4x + 5z = 2$

b) Analyse the beam ABC shown in Figure 1 using flexibility matrix method. AB = 3 m and BC = 6 m. Take EI = constant **[6]**

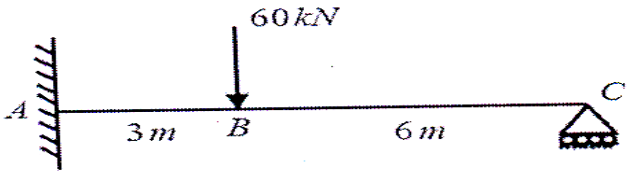

Figure 1

c) A rod is composed of an aluminum section rigidly attached between steel and bronze as shown in Figure 2. If the cross-section area of rod is 800 mm^2 determine nodal displacements. Take E_{st} = 210 GPa, E_{Al} = 70 GPa and E_{br} = 110 GPa. **[8]**

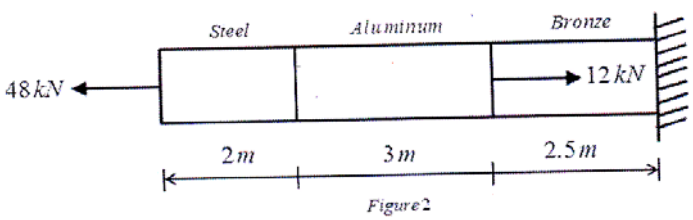

Figure 2

P.T.O.

OR

Q2) a) Solve the following system by Gauss-Elimination Method **[6]**

$x + y + z = 5$

$2x + 3y + 5z = 8$

$4x + 5z = 2$

b) Find the vertical and horizontal deflection at point C for the two member truss as shown in Figure 3. Area of inclined member is 2000 mm^2 whereas horizontal member is 1600 mm^2. Take E = 200 GPa **[6]**

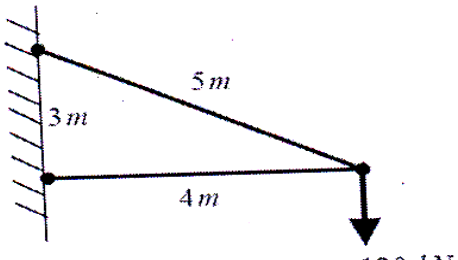

Figure 3

c) Analyse the beam ABC shown in Figure 4 using flexibility matrix method. Take EI = constant. **[8]**

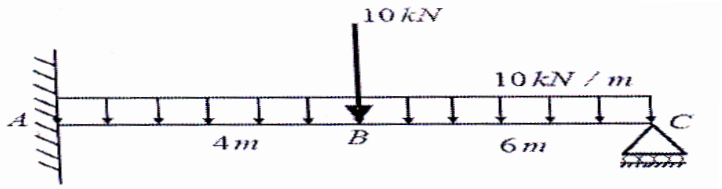

Figure 4

Q3) Analyze the continuous beam ABCD as shown in Figure 5 using stiffness matrix method. Take EI constant. Draw BMD **[18]**

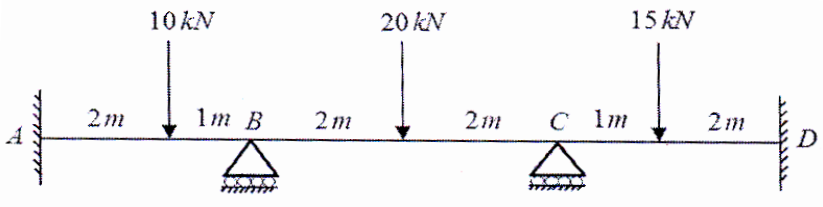

Figure 5

OR

Q4) Determine the unknown joint displacements of the portal frame as shown in Figure 6 using stiffness matrix method. Take EI constant. **[18]**

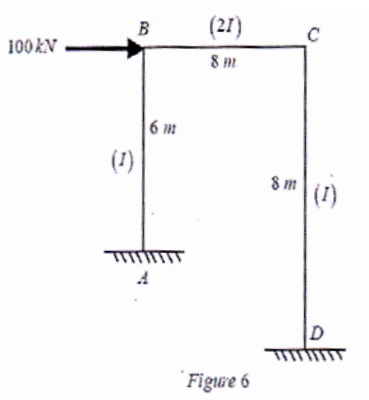

Figure 6

Q5) Derive the stiffness matrix and transformation matrix of two noded grid element of with 06 D.O.F., length L, flexural rigidity EI and torsional rigidity GJ. **[16]**

OR

Q6) Analyze the grid structure ABC as shown in Figure 7 using stiffness matrix method. Take EI=2×10^5 kN.m^2 and GJ= 1.2×10^5 kN.m^2. **[16]**

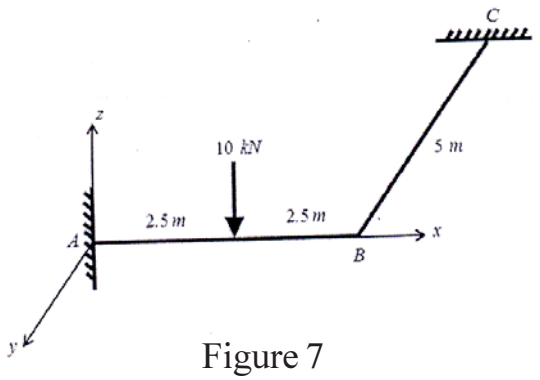

Figure 7

Q7) For the truss shown in Figure 7, use stiffness matrix method to determine the deflections at the loaded joint. Take E = 200 GPa and c/s area of all members 1000 mm^2. **[16]**

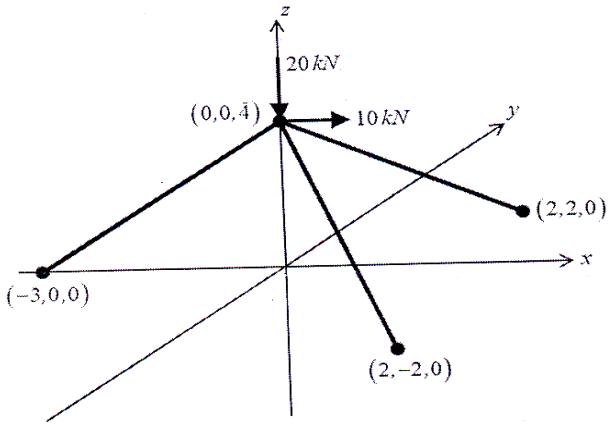

Figure 8

OR

Q8) a) A beam of span '8m' is fixed at both ends 'A' and 'B' and supports a uniformly distributed load of 10 kN/m over the entire span. Estimate the deflections of quarter span intervals using second order central difference formula. **[8]**

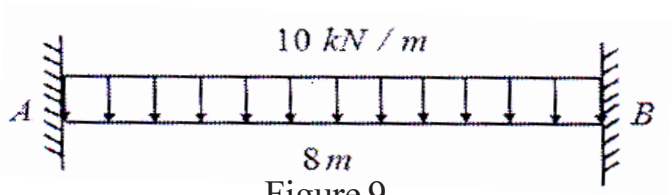

Figure 9

b) Estimate the lowest buckling load 'P' of a uniform pin ended column of length 'L = 10 m', cross-sectional area 100 × 100 mm and E = 200 GPa using three sub intervals. Apply finite difference method. **[8]**