Total No. of Questions : 8]

SEAT No. :

P2118

[Total No. of Pages : 4

[5254]-509
B. A. (Civil Engineering)
MATRIX METHODS OF STRUCTURAL ANALYSIS
(2012 Pattern) (Elective - II)

Time : 2.30 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or 2, Q.3 or 4, Q.5 or 6, Q. 7 or 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***use of electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Write short note on : **[6]**

i) Gauss-Jordan Method

ii) Gauss-Elimination Method

iii) Gauss-Seidal Method

b) Two bars one of aluminum and other of steel are jointed together and subjected to load as shown in Figure 1. Determine displacement at common joint using stiffness matrix method. Take c/s areas of aluminum and steel bars are 2000 mm^2 and 400 mm^2 respectively. Young's modulus of aluminum and steel bars are 70 GPa and 200 GPa respectively. **[6]**

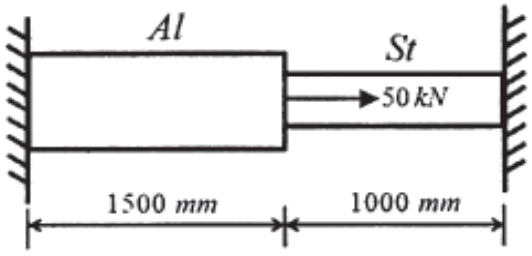

Figure 1.

c) Determine support reactions of continuous beam ABC if support B sink by 10mm. Take EI = 6000 kNm^2. Use flexibility matrix method. **[8]**

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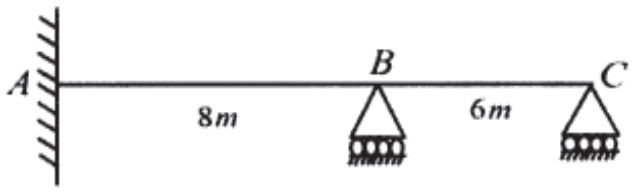

Figure 2.

OR

Q2) a) Write computer flowchart and algorithm for Gauss Jordan Method. **[6]**

b) Determined the prop reaction of the propped cantilever beam AB as shown in Figure 3 using flexibility matrix method. Take EI = constant **[6]**

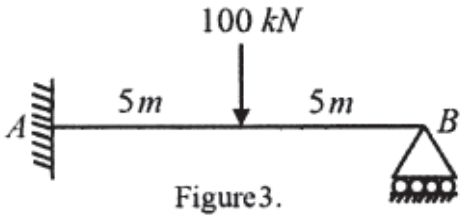

Figure 3.

c) Analyze the two member truss shown in Figure 4 using stiffness matrix method. Take c/s area of each member 1000 mm^2 and E = 200 GPa. The length of each member is 5m. **[8]**

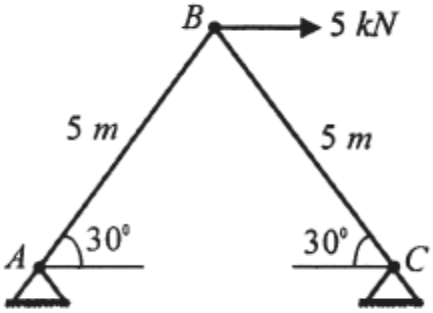

Figure 4.

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

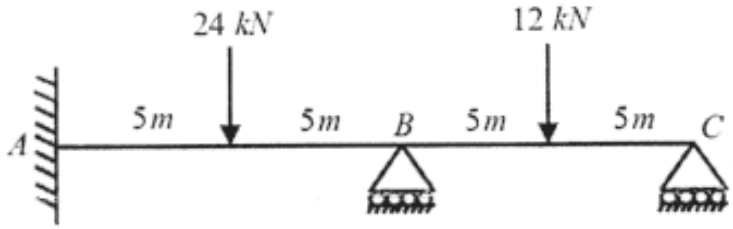

Figure 5

OR

Q4) Analyze the rigid jointed portal frame shown in Figure 6 using stiffness matrix method. Take EI constant. Draw BMD **[18]**

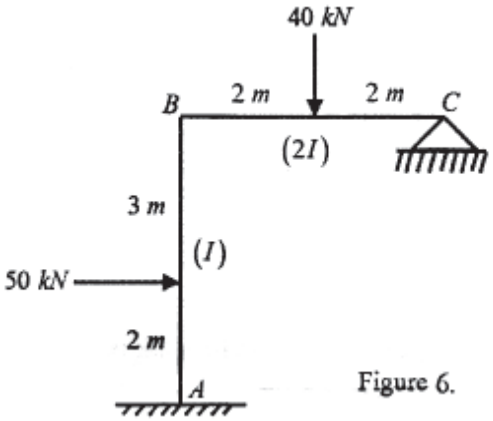

Figure 6.

Q5) a) Derive the stiffness matrix of two noded grid element with 06 D.O.F. as shown in figure 7 Take length L, fiexural rigidity EI and torsional rigidity G.J. **[8]**

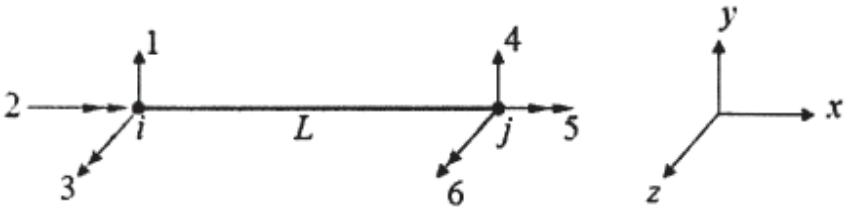

Figure - 7

b) Derive the transformation matrix of two noded grid element. **[8]**

OR

Q6) a) Determine the joint displacements of the grid structure ABC as shown in Figure 8 using stiffness matrix method. Take $E = 2.54 \times 10^7$ kN/m^2, $G = 8.8 \times 10^6$ kN/m^2, $I = 3.188 \times 10^{-3}$ m^4 and $J = 2.230 \times 10^{-3}$ m^4.**[16]**

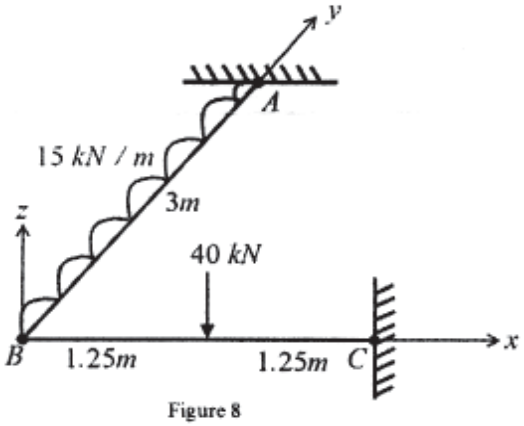

Figure 8

Q7) The tripod shown in Figure 9 is subjected to horizontal and vertical loads. Determine the deflections at the loaded joint using stiffness matrix method. Take E = 200 GPa and c/s area of all members 2000 mm^2. **[16]**

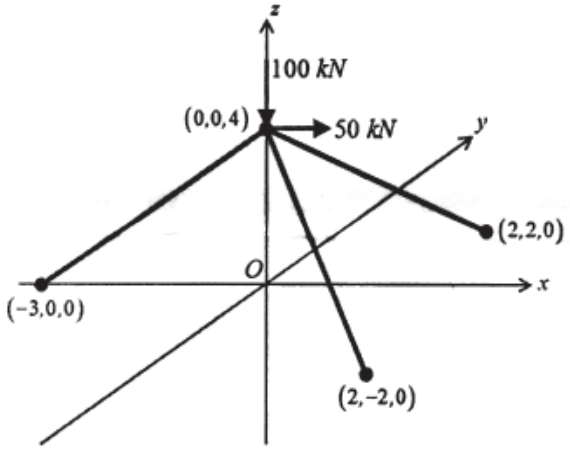

Figure 9

OR

Q8) a) A propped cantilever beam AB fixed at A and propped at B is of length 10m. The beam has constant flexural rigidity and it supports uniformly distributed load of 10 kN/m over the whole length. Considering four sub intervals estimate the maximum deflection. Take EI constant. Apply finite difference method. **[8]**

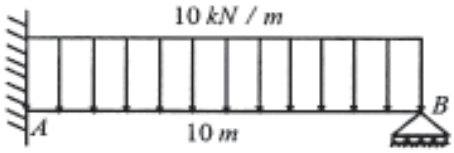

Figure 10.

b) Determine the critical buckling load of a pin ended column with variable moment of inertia using three sub intervals. Apply finite difference method.**[8]**

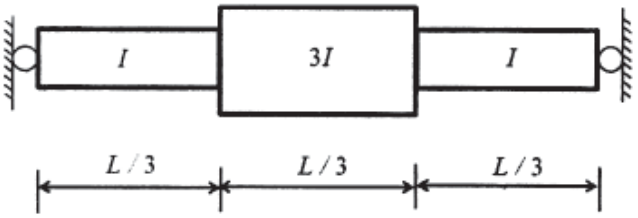

Figure 11.