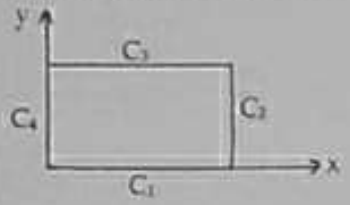
7. Find an approximate solution of the following boundary value problem defined over a rectangular domain.

$$\frac{\partial^2\psi}{\partial x^2}+\frac{\partial^2\psi}{\partial y^2}+1=0;\quad 0<x<1;0<y<0.5$$

With the boundary conditions shown in the following Fig. 6. Use modified Galerkin method and try one or two parameter trial solution is admissible.



$\frac{\partial\psi}{\partial y}=0$ on C_1 ; $\psi=0$ on C_2 and C_3 $\partial\psi/\partial x=0$; on C_4

8. (i) Illustrate the analysis of grid structure by the stiffness method taking a simple example.

(ii) Load vector and Semi -band width.

Roll No. .....

23721

M. Tech. 1st Semester (Civil Engg. Computer Aided Structural Engg.) Examination – February, 2022

ADVANCED METHODS OF STRUCTURAL ANALYSIS

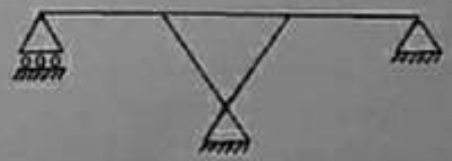
Paper : 21MTCASE2C1

Time : Three Hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any *five* questions. All questions carry equal marks.

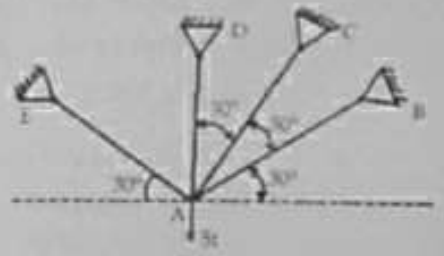
1. (i) Determine the degree of static and kinematic indeterminacies of the frame shown in Figure 1.



(ii) Discuss why the released structure which minimizes the magnitudes of the redundant generally leads to maximum accuracy ?

(iii) Discuss the element approach and its suitability for the automatic analysis of structures by a digital computer.

(iv) Analyse the frame shown in Figure (2) by force method. Hence determine the force in member AE. The axial flexibility, L/AE is same for all the members.



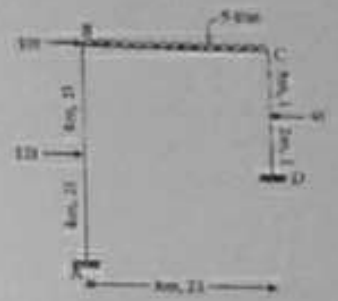
2. (i) Briefly explain different types of co-ordinate systems with neat sketches in matrix analysis.

(ii) Briefly explain the following. (i) List of co-ordinate system used in FEM (ii) Types of boundary conditions.

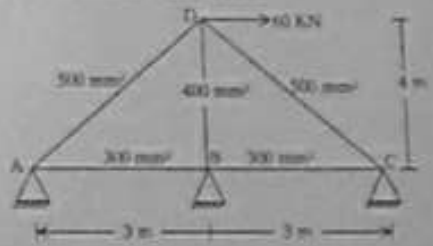
3. (i) Derive shape function of one-dimensional linear element (Use Matrix method).

(ii) What are the different types of element shapes used in finite element methods and explain with neat sketches ?

4. Analyze the portal frame shown in figure 3 by displacement method and also draw the B.M.D and S.F.D.



5. Analysis the pin jointed truss shown in Fig. 4 by flexibility method and find the forces in all the members. Assume E = 200 GPa.



6. Analysis the portal frame by the stiffeners method and find the moments at the joints A, B, C, of D of Fig. 5 (EI = Constant).