Register No.: …… Name: ……

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER M.TECH DEGREE EXAMINATION (Regular), FEBRUARY 2022

(Structural Engineering and Construction Management)

(2021 Scheme)

Course Code : **21SC104-A**

Course Name: **Advanced Analysis of Structures**

Max. Marks : **60** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

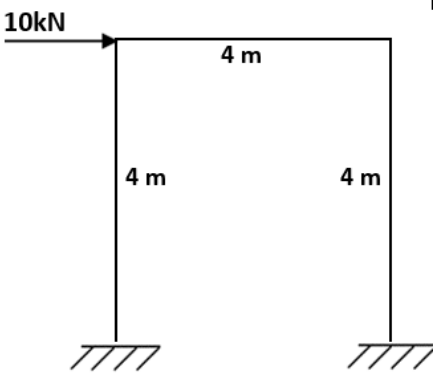
1. Define the 'Degree of Freedom' of a structure. Write the values for a (i) Simply supported beam, and (ii) Fixed beam.
2. Establish the relation connecting stiffness matrix and flexibility matrix taking any simple structure.
3. Develop the Rotation transformation matrix and prove that it is an orthogonal matrix.
4. Describe how the internal forces due to lack of fit are considered in the analysis of a truss using Flexibility matrix method.
5. Interpret the advantages of 'Direct stiffness method' in Matrix methods of structural analysis.
6. List the properties of Stiffness and Flexibility matrices.
7. What are the three modes of operation offered in STAAD?
8. Recall the four types of structures that STAAD can handle.

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

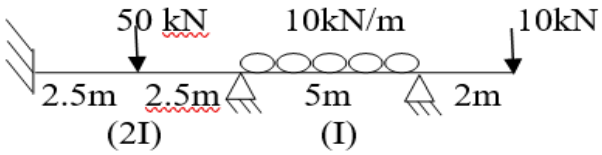
9. Generate the 'Displacement transformation matrix' and hence develop the Stiffness matrix for the rigid frame shown:



(6)

OR

10. Create the 'Displacement transformation matrix' and hence develop the structure stiffness matrix:



(6)

MODULE II

11. Develop the stiffness matrix for the coordinates shown. Also outline the procedure for conversion of this to structure coordinates.

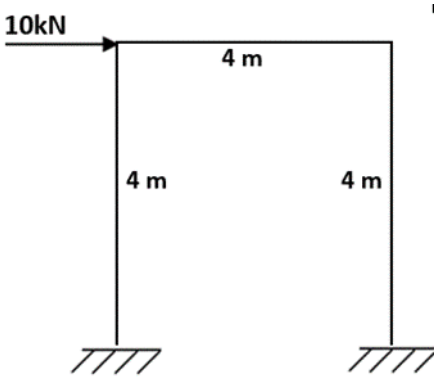
(6)

OR

12. State and prove the 'Principle of contra gradience' in Matrix Method of structural analysis (6)

MODULE III

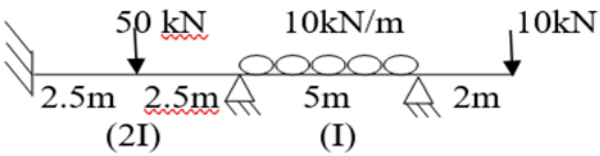
13. Analyze the rigid frame shown below using Stiffness matrix method and draw the bending moment and shear force diagrams.



(6)

OR

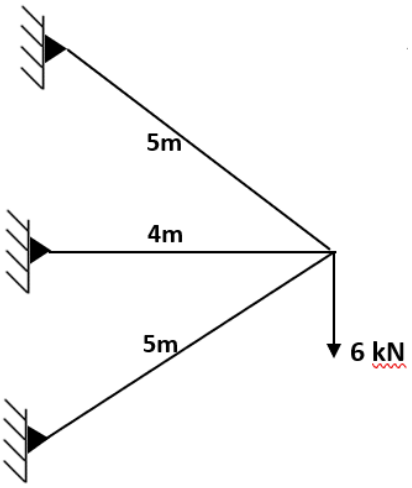
14. Apply Stiffness matrix method to analyse the continuous beam shown in figure. Sketch the bending moment diagram.



(6)

MODULE IV

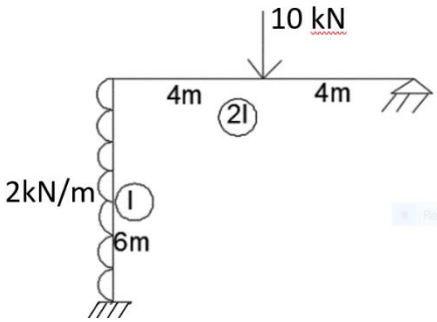
15. Apply Flexibility matrix method to the pin jointed truss and evaluate the forces in the members. Assume L/AE same for all members.



(6)

OR

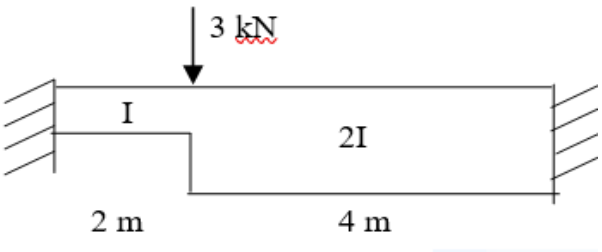
16. Analyse the frame by Flexibility matrix method.



(6)

MODULE V

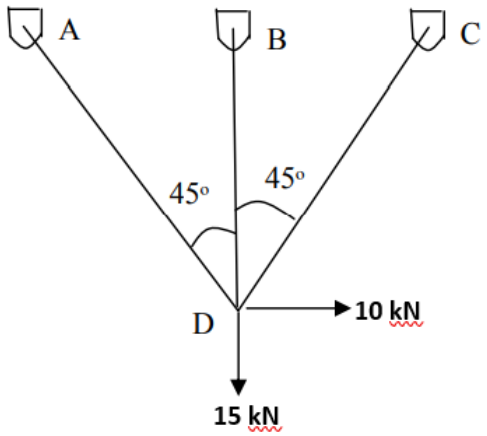
17. Analyze the fixed beam shown below applying Direct stiffness matrix method:



(6)

OR

18. Apply Direct stiffness matrix method and get the forces in the members of the steel truss shown in figure. Assume same axial rigidity for all members. (6)



MODULE VI

19. Outline the step-by-step procedure for analysis and design of a four-storied building using STAAD.Pro. (6)

OR

20. Outline the step-by-step procedure for analysing a rigid frame using ETABS. (6)

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