Register No.: ..... Name: .....

# SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**FIFTH SEMESTER B.TECH DEGREE EXAMINATION (S),** FEBRUARY 2023

**CIVIL ENGINEERING**

**(2020 SCHEME)**

**Course Code : 20CET301**

**Course Name: Structural Analysis – I**

**Max. Marks : 100** **Duration: 3 Hours**

## PART A

***(Answer all questions. Each question carries 3 marks)***

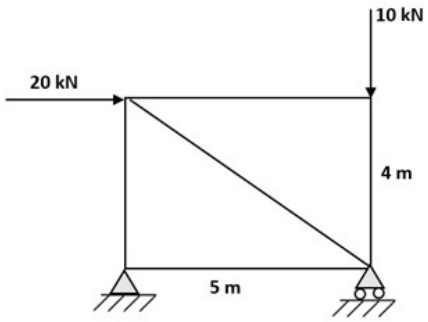
1. What is the advantage of 'Method of Sections' over 'Method of Joints' in analysis of trusses?
2. Derive the relation between strain energy and displacement.
3. Determine the degrees of static indeterminacy and kinematic indeterminacy of a two-span continuous beam with hinged supports at both ends, carrying transverse loads only.
4. What is 'lack of fit' in a truss? How it is reflected in the analysis of the structure?
5. State and prove Maxwell's Reciprocal theorem.
6. Develop the general Slope-deflection equations.
7. Show that the profile of a cable subjected to a uniformly distributed loading is a parabola.
8. List any three assumptions made in the analysis of Cables.
9. Illustrate how a three-hinged arch can be analysed.
10. Construct the Influence Line Diagram for shear force at quarter span of a simply supported beam.

## PART B

***(Answer one full question from each module, each question carries 14 marks)***

### MODULE I

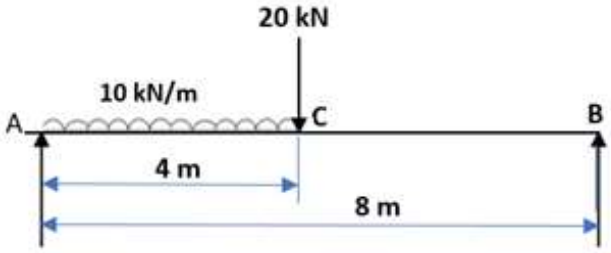
11.Analyse the truss shown below and list the forces in the members:




(14)

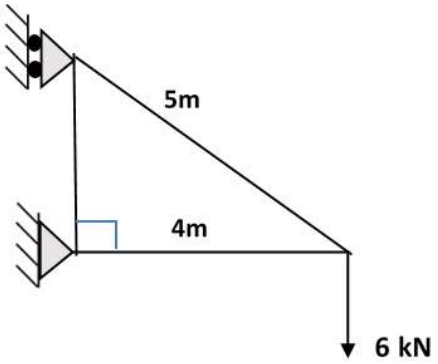
**OR**

12. Apply the method of Successive integrations and solve the deflection at mid span of the simply supported beam shown. Assume constant flexural rigidity. (14)




**MODULE II**

13. Apply the Unit load method to determine the horizontal deflection of the loaded joint of the steel truss shown in figure. Take area of cross section of all members as 200 $mm^2$. (14)

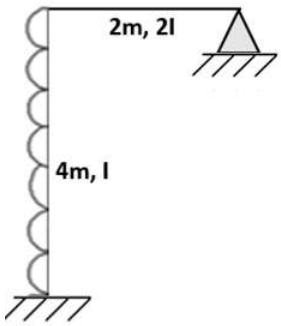



**OR**

14. Apply the method of Consistent deformation to analyse a propped cantilever carrying a point load at midspan. (14)

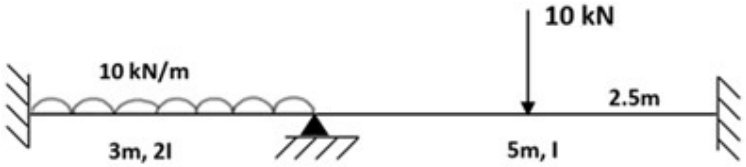
**MODULE III**

15. Analyse the rigid frame by Slope-deflection method and plot the BMD. (14)



**OR**

16. Apply the Moment distribution method and analyse the continuous beam.
Also plot the BMD.




(14)

**MODULE IV**

17. A cable subjected to a uniform load of 250 N/m is suspended between two supports at the same level 30 m apart. If the cable has central sag of 4 m, determine (i) the horizontal reactions at the supports, (ii) the minimum tension and (iii) maximum tension in the cable, and (iv) the total length of the cable. (14)

**OR**

18. a) Prove that the profile of cable supporting uniformly distributed loads is a parabola. Estimate the length of this cable. (7)
b) Prove that the maximum tension occurs adjacent to the supports. (7)

**MODULE V**

19. A parabolic three-hinged arch carries a UDL of 25 kN/m on the left half of the span. It has a span of 20 m and a central rise of 4 m. Determine the resultant reactions at the supports. Find the bending moment, normal thrust and radial shear at a section 3m from left support. (14)

**OR**

20. A simply supported girder has a span of 80 m. Two point loads of 200 kN and 300 kN act on the girder at 16 m and 32 m from left end. Construct and apply the Influence Line Diagrams to estimate the shear force and bending moment at 25 m from left end of this girder. (14)

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