A   **1100CET301112401**

Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (R, S) /S5 (WP) (R) /S3 (PT) (S,FE) Examination November 2024 (2019 Scheme)

Course Code: CET 301
Course Name: STRUCTURAL ANALYSIS - I

Max. Marks: 100   Duration: 3 Hours

PART A
(Answer all questions; each question carries 3 marks)   Marks

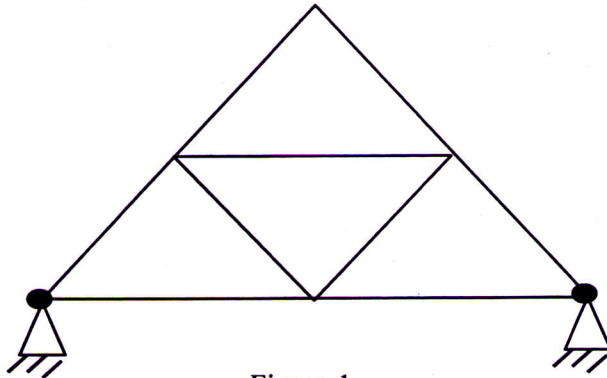|		
1	List the assumptions made in the analysis of truss.	3
2	State and explain Castigliano's theorem.	3
3	Find the degree of redundancy (SI) for the structure shown in figure 1.	3

Figure 1

4	Explain Moment-area theorems.	3
5	List the possibilities of occurrence of sway in frames.	3
6	Write the expression for absolute stiffness to rotate the near end of the prismatic beam for the following conditions	3
	(i) Far end being freely supported.	
	(ii) Far end being fixed.	
7	Determine the vertical and horizontal reactions at the supports when a cable is subjected to udl and is supported at the same level .	3
8	Draw a neat diagram showing the different parts of a suspension bridge.	3
9	Explain Eddy's theorem.	3
10	Draw the ILD for the bending moment and shear force at a section in the span of a simply supported beam when a unit load is placed at the section .	3

PART B
(Answer one full question from each module, each question carries 14 marks)
Module -1

11   Analyse the truss shown in figure 2 using method of joints and tabulate the force   14
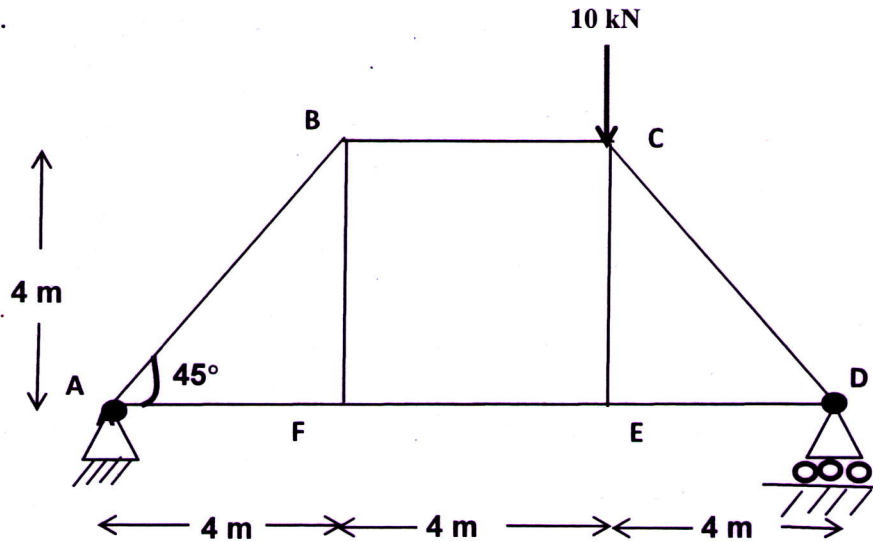table.

Figure 2

12   a)   Determine the slope and deflection at the free end of a cantilever with a point   8
load W at the free end using double integration method.

    b)   Determine the slope and deflection at the free end of a cantilever beam of span   6
length 2.5 m. using Moment Area method. The cantilever has a concentrated load
of 10 kN at a distance of 1.5 m from the fixed end and another concentrated load
of 5 kN at the free end. Take EI = 4000 kN/m^2.

Module -2

13   Determine the vertical and horizontal displacements of the point C of the pin-   14
jointed frame shown in figure 3. The cross sectional area of AB is 100 sq.mm
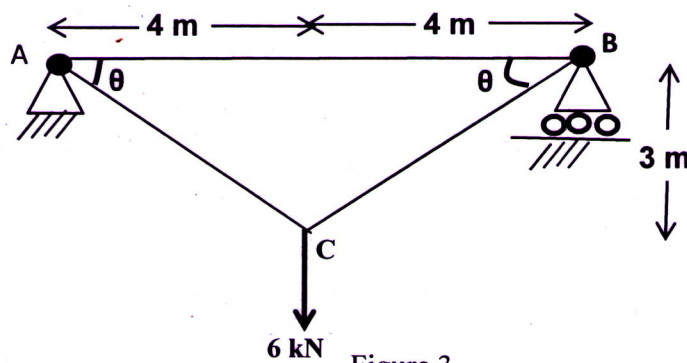and of AC and BC is 150 sq mm each. Take E = 2 x 10^5 N/mm^2.

6 kN   Figure 3

14   Analyse the continuous beam shown in figure 4 using method of consistent   14
deformation method. (Take V_B as redundant)

20 kN   **20 kN**

A   B   C

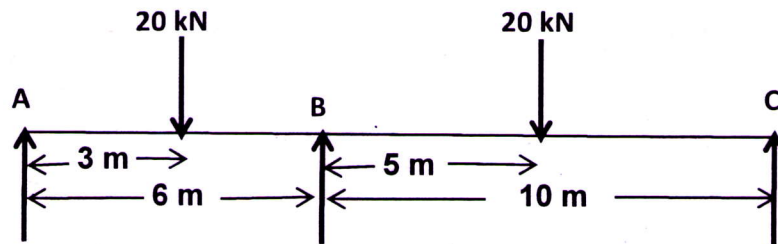← 3 m →   ← 5 m →

← 6 m → ← 10 m →

Figure 4

Module -3

15   A continuous beam ABCD consists of three spans and is loaded as shown in   14
figure 5. Ends A and D are fixed. Analyse the beam using slope deflection
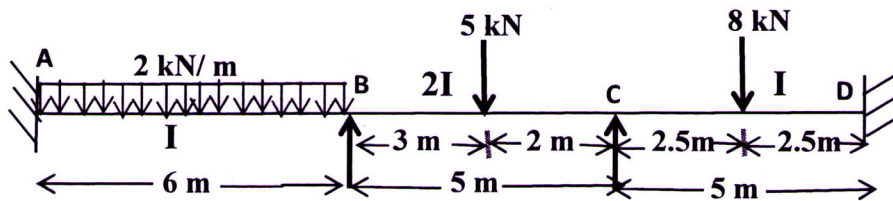method and plot the bending moment diagram.

5 kN   **8 kN**

A   2 kN/ m   B   2I   C   I   D

I   ←3 m →←2 m→←2.5m→←2.5m→

← 6 m → ← 5 m → ← 5 m →

Figure 5

16   Analyse the beam shown in the figure 6 using Moment distribution method and   14
plot the bending moment diagram.

60 kN

A   20 kN/ m   B   I   C

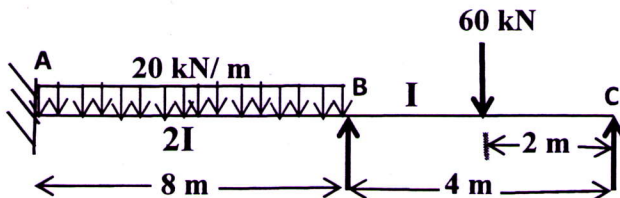2I   ←2 m→

← 8 m → ← 4 m →

Figure 6

Module -4

17   A light cable is subjected to three concentrated loads of 40 kN, 30 kN and 20 kN   14
at 5m, 10m and 15 m from the left support. The cable is supported at two points
20 m apart and are at the same level. The deflection under the first concentrated
load is 0.8 m. Determine the tension in the different segments and also the length
of the cable.

18   A cable is suspended from points A and B which are 80 m apart and are at   14
different levels. Point A be 5 m vertically higher than point B and lowest point
in the cable is 10 m below A. Cable is subjected to a udl of 30 kN/m over the

entire span. Determine horizontal and vertical reaction and also length of the cable. Also determine the maximum and minimum tensions in the cable.

Module -5

19 a) A three hinged parabolic arch hinged at the supports and at the crown has a span of 24 m and a central rise of 4 m. It carries a concentrated load of 50 kN at 18 m from the left support and a udl of 30 kN/m over the left half. Determine the support reaction, normal thrust and radial shear at 6 m from the left support. 11

    b) List any two advantages of arches over beams. 3

20   Four wheel loads of 6 kN, 4 kN, 8kN and 5 kN cross a girder of 20 m span, from left to right followed by an uniformly distributed load of 4 kN/m and 4 m long with the 6 kN load leading. The spacing between the loads in the same order are 3 m, 2 m and 2 m. The head of the udl is at 2 m from the last 5 kN load. Using influence lines, calculate the maximum positive SF, negative SF, maximum SF and BM at a section 8 m from the left support when the 4 kN load is at centre of the span. 14

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