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KUMARAGURU
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B.E DEGREE EXAMINATIONS: MAY 2017

(Regulation 2014)

Sixth Semester

CIVIL ENGINEERING

U14CET601: Structural Analysis II

COURSE OUTCOMES

CO1: analyze Space Truss using tension Coefficient method

CO2: analyze cable suspension bridges

CO3: perform plastic analysis of indeterminate beams and frames

CO4: analyze structures by using matrix flexibility and stiffness methods

CO5: implement basic concepts of finite element analysis

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Match list I with list II and select the correct answer CO1 [K_2]

List I	List II
A. UDL due to dead load on stiffening girder	i. Statically determinate
B. Cable hinged at two ends	ii. Space frame
C. Curved beams	iii. No shear force
D. Transmission tower	iv. Torsional moment

	A	B	C	D
a)	ii	i	iii	iv
b)	iii	iv	ii	i
c)	ii	iv	iii	i
d)	iii	i	iv	ii

2. Deflection in a cable can be determined using CO2 [K_1]

a) Unit load method b) Moment area method

c) Conjugate beam method d) None of the above

3. Consider the following statements. CO3 [K_2]

1. Mechanism method of analysis is based on upper bound theorem.
2. Plastic hinge is defined as an unyielded zone due to bending in a structural member.
3. Shape factor and elastic modulus of section are directly proportional to each other.
4. The safety factor is usually termed as load factor.

Which of these statements are correct?

a) 1,3 b) 1,4

c) 1,2 d) 2,3

4. The shape factor for a rectangular section is CO3 [K_2]

a) 1.5 b) 2.346

c) 2.0 d) 1.697

5. Assertion (A): For determinate flexural members, developing flexibility matrix is only to find deflections due to a set of given forces. CO4 [K_2]

Reason (R): In flexibility method, it is not necessary that all indeterminate structures are to be converted as primary structure.

a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A

c) A is true but R is false d) A is false but R is true

6. The flexibility method is also known as CO4 [K_2]

a) Displacement method b) Equilibrium method

c) Compatibility method d) Moment method

7. Consider the following steps of analysis using matrix stiffness method. CO4 [K_2]

1. System stiffness matrix 2. Assembled element stiffness matrix

3. Element forces 4. Assign system coordinates

The correct sequence of the analysis is,

a) 2-3-4-1 b) 1-3-2-4

c) 3-4-2-1 d) 4-3-2-1

8. If the number of system coordinate and element coordinate is equal to 3 and 6 respectively, the size of the transformation matrix [β] will be CO4 [K_2]

a) 6 x 3 b) 3 x 6

c) 1 x 6 d) 1 x 3

9.	Assertion (A): Discretization of a structure into elements is a common process of finite element analysis. Reason (R): The elements of larger size yields more accurate results a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A c) A is true but R is false d) A is false but R is true	CO5	$[K_2]$
10.	The stiffness matrix for a truss element is given by a) $[K]=\left(\frac{AE}{l}\right)\begin{bmatrix}1 & -1\\ -1 & 1\end{bmatrix}$ b) $[K]=\left(\frac{EI}{l}\right)\begin{bmatrix}1 & -1\\ -1 & 1\end{bmatrix}$ c) $[K]=\left(\frac{Pl}{AE}\right)\begin{bmatrix}1 & -1\\ -1 & 1\end{bmatrix}$ d) $[K]=\left(\frac{l}{AE}\right)\begin{bmatrix}1 & -1\\ -1 & 1\end{bmatrix}$	CO5	$[K_2]$

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11.	Draw the bending moment diagram for a curved beam of radius R, fixed at support A and free at end B carrying a concentrated load W at the free end B.	CO1	$[K_2]$
12.	Explain the functions of stiffening girders.	CO2	$[K_2]$
13.	Compare upper and lower bound theorems.	CO3	$[K_2]$
14.	Define shape factor.	CO3	$[K_2]$
15.	Define a Primary structure.	CO4	$[K_2]$
16.	Discuss the importance of compatibility conditions.	CO4	$[K_2]$
17.	Define a rotation matrix.	CO4	$[K_2]$
18.	Illustrate the properties of a symmetric matrix.	CO4	$[K_2]$
19.	Define discretization.	CO5	$[K_2]$
20.	Compare plane stress and plane strain problems in finite element analysis.	CO5	$[K_2]$

Answer any FIVE Questions:-

PART C (5 x 14 = 70 Marks)

(Answer not more than 300 words)

Q.No. 21 is Compulsory

21.	Explain in detail the steps involved in finite element analysis with an example.	CO5	$[K_3]$

22.	A continuous beam ABC is loaded as shown in Figure 1. Estimate the required plastic moment M_P if the load factor is 3.2.	CO3	[K_3]

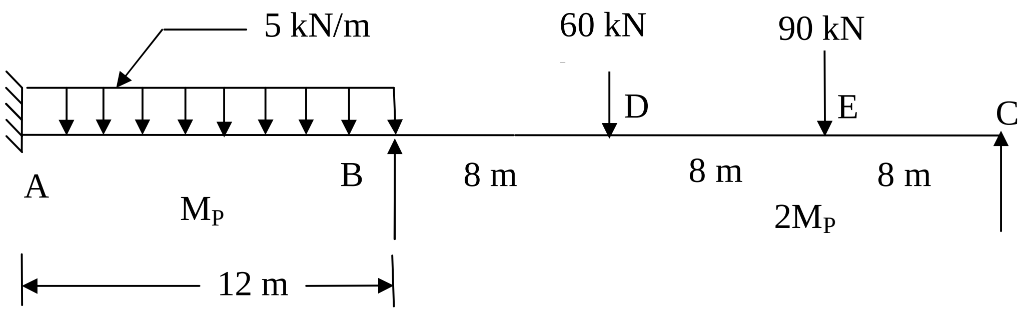

Figure 1

23.	Analyze the continuous beam shown in Figure 2 by matrix flexibility method. Also plot the bending moment diagram.	CO4	[K_3]

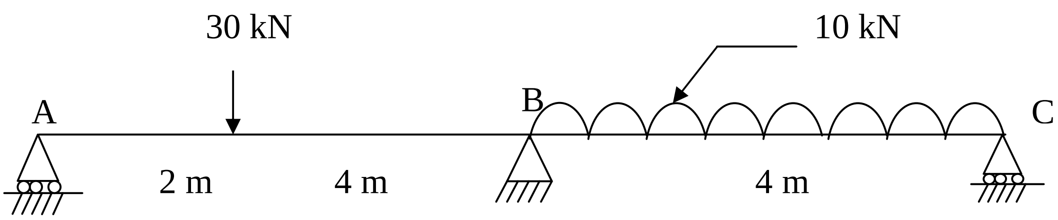

Figure 2

24.	Analyze the continuous beam shown in Figure 3 by matrix stiffness method. Also plot the bending moment diagram.	CO4	[K_3]

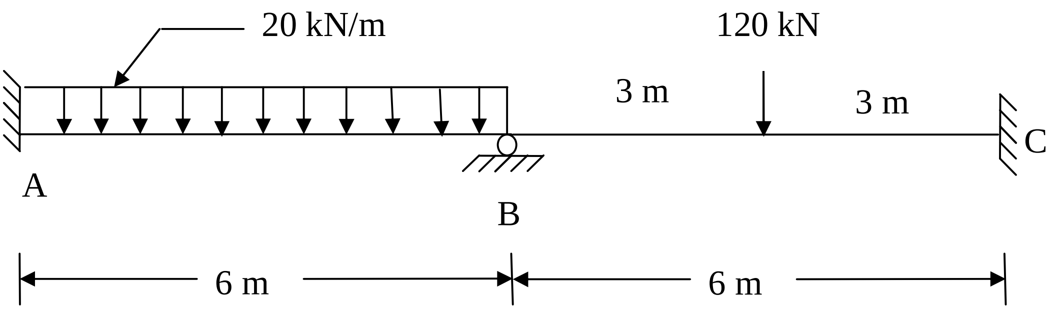

Figure 3

25. A suspension bridge of 140 m span has two nos. of three hinged stiffening girders supported by two cables with a central dip of 12 m. The width of the roadway supported by the girder s 5 m. The dead load is 7 kN/m^2 of floor area. A live load of 12.5 kN/m^2 covers the left hand half of the bridge. Determine the shear force and bending moment at the loaded quarter span point. Also determine the maximum tension in the cable. CO2 [K_3]

26. Analyze the frame shown in Figure 4 by stiffness method. Plot the bending moment diagram. CO4 [K_3]

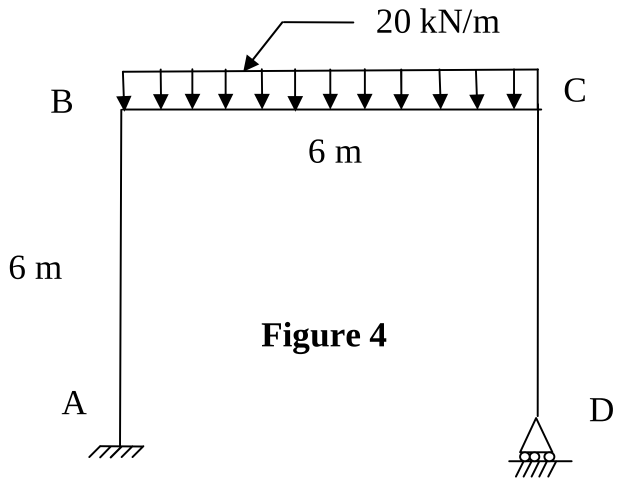

Figure 4

27. Analyze the space truss shown in Figure 5 using method of tension coefficients and find the forces in the members of the truss. CO1 [K_3]

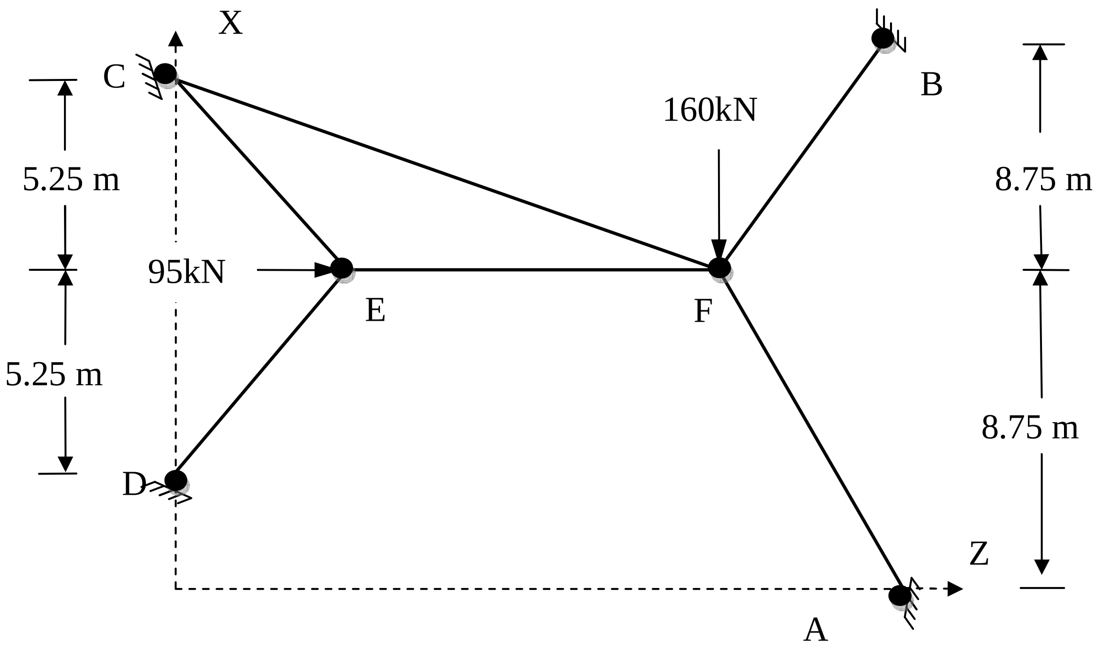

Figure 5(a) PLAN

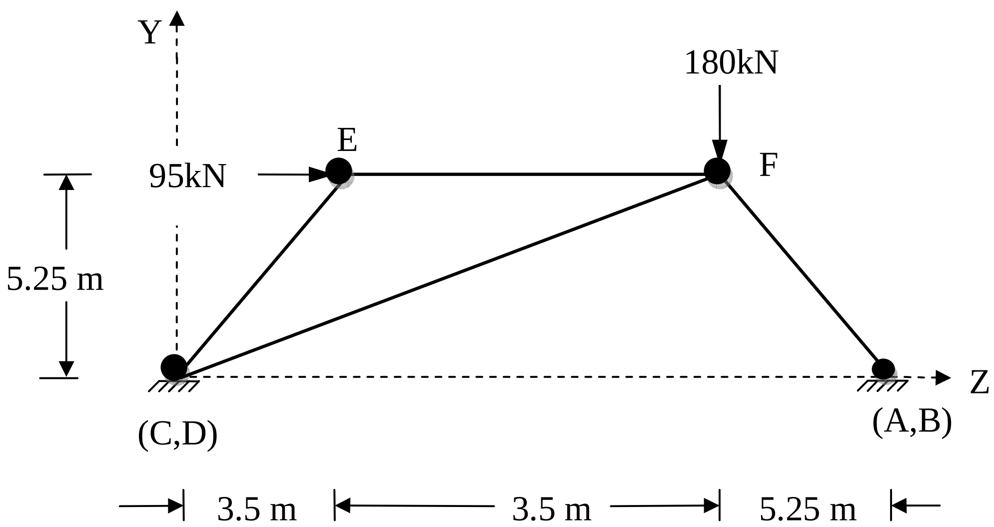

Figure 5(b) ELEVATION

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