SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

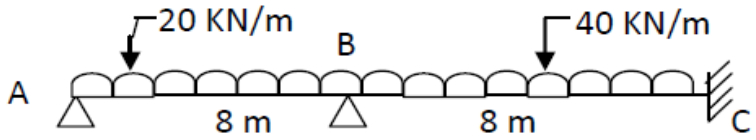
Subject with Code : SA-II (13A01505) **Course & Branch**: B.Tech – CE

Year & Sem: III-B.Tech & I-Sem **Regulation:** R13

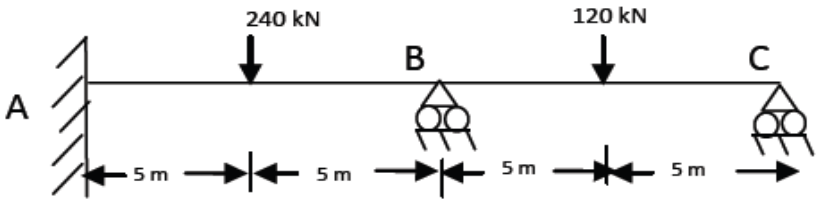
UNIT – IV

FLEXIBILTY AND STIFFNESS METHOD

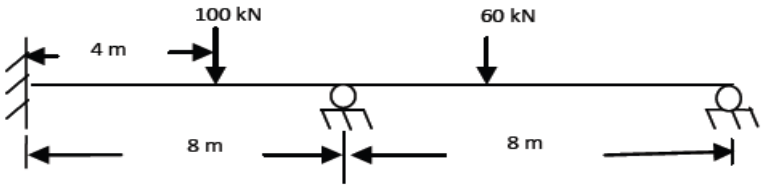
1. Analyse the beam shown in figure using flexibility matrix method if the support B' sinks by 50 mm. E = 25X103 MPa, I = 140X103 cm^4. 10M



2. Analyze the continuous beam shown in figure below. Assume EI is constant. Use matrix flexibility method. 10M



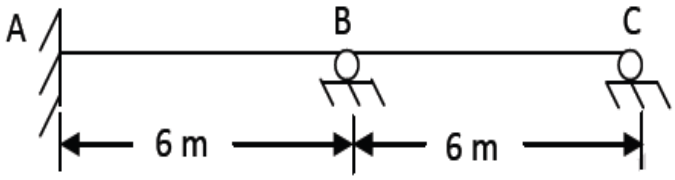
3. Analyze the continuous beam as shown in figure below, if the beam undergoes settlement of supports B and C by 200/EI and 100/EI respectively. Use flexibility method. 10M



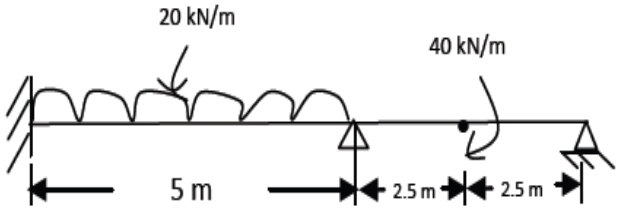
4. A two span continuous beam ABC rests on simple supports at A,B and C.All the three supports are at same level. The span AB=7m and span BC=5m. The span AB carries a uniformly distributed load of 30kN/m and span BC carries a central point load of 30kN. EI is constant for the whole beam. Find the moments and reactions at all the support using flexibility method. 10M

5. A two span continuous beam ABC is fixed at A and C and rests on simple support at B. All the three supports are at same level. The span AB=4.5m and span BC=6.3m. The span AB carries a uniformly distributed load of 48kN/m and span BC carries a central point load of 75kN. EI is constant for the whole beam. Find the moments and reactions at all the support Using stiffness method. 10M

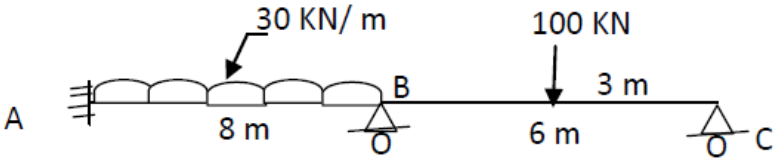
6. Using displacement method, analyze the continuous beam as shown in figure below. The support C sinks by 120/EI. Draw BMD. 10M



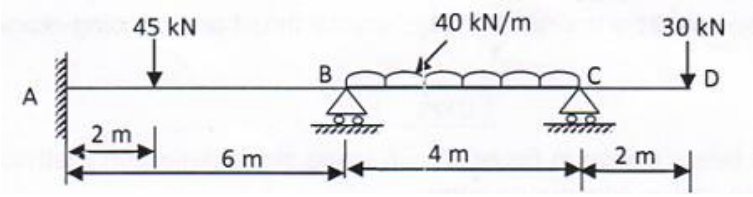
7. A two span continuous beam shown in figure below. The moment of inertia is constant throughout. Analyze the beam by stiffness method. 10M



8. Analyse the continuous beam shown in fig using stiffness method and draw BMD. 10M



9. Analyse the continuous beam in given below, by stiffness method. Draw the bending moment diagram. Take AB =2I,BC=CD=I 10M



10. a) write the concept in flexibility method 2M
    b) define stiffness and write the basic equation of stiffness method 2M
    c) What are the requirements to be satisfied in analyzing any structure? 2M
    d) What is the basic aim of stiffness method? 2M
    e) What is the relation between flexibility and stiffness matrix? 2M

Prepared by: **J.K.Elumalai**.

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UNIT – IV

FLEXIBILTY AND STIFFNESS METHOD

1. Compatibility conditions are primarily governed by [ ]
   A) Strain B) stress C) temperature D) force
2. Number of compatibility condition needed analysis of statically determinate structure are
   A) 0 B) 2 C) 3 D) 6 [ ]
3. Minimum number of equilibrium equations required for a plane frames analysis of structure is
   A) 2 B) 3 C) 5 D)6 [ ]
4. Minimum number of equilibrium equations required for a space frames analysis of structure is
   A) 3 B) 6 C)8 D)9 [ ]
5. The number of independent equations to be satisfied for static equilibrium of a plane structure is [ ]
   A) 3 B) 9 C) 1 D) 6
6. If there are m unknown member forces, r unknown reaction components and j number of joints, then the degree of static indeterminacy of a pin-jointed plane frame is given by [ ]
   A) m + r + 2j B) m - r + 2j C) m + r - 2j D) m + r - 3j
7. Number of unknown internal forces in each member of a rigid jointed plane frame is [ ]
   A) 3 B) 2 C) 3 D) 6
8. Degree of static indeterminacy of a rigid-jointed plane frame having 15 members, 3 reaction components and 14 joints is [ ]
   A) 2 B) 3 C) 6 D) 8
9. Degree of kinematic indeterminacy of a pin-jointed plane frame is given by [ ]
   A) 2j + r B) j - 2r C) 3j – r D) 2j - r
10. Independent displacement components at each joint of a rigid-jointed plane frame are [ ]
    A) three linear movements B) two linear movements and one rotation
    C) one linear movement and two rotations D) three rotations
11. If in a pin-jointed plane frame (m + r) > 2j, then the frame is [ ]
    A) stable and statically determinate B) stable and statically indeterminate
    C) unstable D) none of the above
12. where m is number of members, r is reaction components and j is number of joints
    A pin-jointed plane frame is unstable if [ ]

A) (m + r)>2j B) m + r = 2j C) (m + r)<2j D) none of the above

13. where m is number of members, r is reaction components and j is number of joints
A rigid-jointed plane frame is stable and statically determinate if [ ]
A) (m + r) = 2j B) (m + r) = 3j C) (3m + r) = 3j D) (m + 3r) = 3j

14. where m is number of members, r is reaction components and j is number of joints
The number of independent equations to be satisfied for static equilibrium in a space structure is [ ]
A) 6 B) 4 C) 3 D) 2

15. For a fixed support, the numbers of reactions are [ ]
A) 1 B) 2 C) 3 D) 4

16. For a roller support, the numbers of reactions are [ ]
A) 1 B) 2 C) 3 D) 4

17. For a pinned support, the numbers of reactions are [ ]
A) 1 B) 2 C) 3 D) 4

18. External redundancy can be calculated by [ ]
A) E=R-r B) E=R+r C) E=r-R D) E= r+R

19. For a beam, if fundamental equations of statics are not sufficient to determine all the reactive forces at the supports, the structure is said to be [ ]
A) Determinate B) Statically determinate C) Statically indeterminate D) none

20. For a beam, if fundamental equations of statics are sufficient to determine all the reactive forces at the supports, the structure is said to be [ ]
A) Determinate B) Statically determinate C) Statically indeterminate D) none

21. If the beam is supported so that there are only three unknown reactive elements at the supports. These can be determined by using [ ]
A) $\sum H = 0$ B) $\sum V = 0 \ \sum H = 0$ C) $\sum H = 0 \sum V = 0 \sum M = 0$ D) none

22. For a beam having fixed ends, the unknown element of the reactions is [ ]
A) Horizontal components at either end B) vertical components at either end
C) Horizontal component at one end and vertical component at other end
D) Horizontal component and vertical component at both ends.

23. The deformation of a spring produced by a unit load is called [ ]
A) Stiffness B) flexibility
C) Influence coefficient D) unit strain

24. For stable structures, one of the important properties of flexibility and stiffness matrices is that the elements on the main diagonal
    i) Of a stiffness matrix must be positive
    ii) Of a stiffness matrix must be negative
    iii) Of a flexibility matrix must be positive
    iv) Of a flexibility matrix must be negative
    The correct answer is [ ]
    A) (i) and (iii) B) (ii) and (iii) C) (i) and (iv) D) (ii) and (iv)

25. To generate the j^{th} column of the flexibility matrix [ ]
    A) a unit force is applied at coordinate j and the displacements are calculated at all coordinates
    B) a unit displacement is applied at co-ordinate j and the forces are calculated at all coordinates
    C) a unit force is applied at coordinate j and the forces are calculated at all coordinates
    D) a unit displacement is applied at co-ordinate j and the displacements are calculated at all co-ordinates

26. Select the correct statement [ ]
    A) Flexibility matrix is a square symmetrical matrix
    B) Stiffness matrix is a square symmetrical matrix
    C) Both (A) and (B) D) none of the above

27. The force required to produce unit deformation is [ ]
    A) Stiffness B) flexibility
    C) Influence coefficient D) unit strain

28. The systematic development of slope-deflection method in the matrix form is known as to
    A) Stiffness matrix method [ ]
    B) Displacement matrix method
    C) Equilibrium method
    D) All the above

29. Flexibility matrix method is known as [ ]
    1. Force method
    2. Compatibility method
    3. Displacement method
    4. Equilibrium method
    Select your answer code from the list given below
    A) 1 and 2 are true B) 2 and 3 are true C) 3 and 4 are true D) 1 and 4 are true

30. End A of beam AB is hinged and end B is on roller. The degree of kinematic indeterminacy is
    A) 3 B)2 C)1 D) zero

31. The elements of flexibility matrix of a structure [ ]
    A) Are dependent on the choice of coordinates
    B) Are independent of the choice of coordinates
    C) Are always dimensionally homogeneous D) Both a and c

32. The element δ_{ij} if a flexibility matrix is [ ]
    A) The displacement at coordinate j due to a unit force at coordinate i
    B) The displacement at coordinate i due to a unit force at coordinate j

C) The force at coordinate j due to a unit displacement at coordinate i
D) The force at coordinate i due to a unit displacement at coordinate j

33. The number of equation required over and above the equations of static equilibrium for the analysis of structure is known as [ ]
A) The degree of kinematic indeterminacy or degree of freedom
B) The degree of static indeterminacy or degree of redundancy
C) Both A and B
D) None of the above

34. The number of equilibrium conditions required to find the displacement components of at joints of the structure are known as [ ]
A) The degree of kinematic indeterminacy or degree of freedom
B) The degree of static indeterminacy or degree of redundancy
C) Both A and B
D) None of the above

35. The systematic development of consistent deformation method has led to flexibility method which is also known as the [ ]
A) Force method B) compatibility method C) both A and B D) none

36. The element k_{ij} if a stiffness matrix is [ ]
A) The displacement at coordinate j due to a unit force at coordinate i
B) The displacement at coordinate i due to a unit force at coordinate j
C) The force at coordinate j due to a unit displacement at coordinate i
D) The force at coordinate i due to a unit displacement at coordinate j

37. Flexibility and stiffness matrices are [ ]
A) Equal to each other B) Opposite to Each other
C) Inverse of each other D) none of the above

38. The stiffness coefficient for beam due to axial unit force [ ]
A) AE/L B) EI/L C) AG/L D) None

39. The loading on the conjugate beam will be [ ]
A) Loading on the real beam divided by EI
B) B.M. diagram multiplied by EI
C) B.M diagram divided by S.F. diagram
D) B.M diagram divided by EI

40. The deflection at a section in the real beam is equal to [ ]
A) The bending moment at that section in the conjugate beam
B) EI times the bending moment at that section in the conjugate beam
C) The shear force at that section in the conjugate beam
D) The moment of the bending moment diagram of conjugate beam about that section

Prepared by: **J.K.Elumalai**.