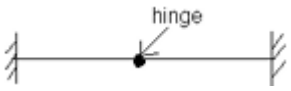
DEPARTMENT OF CIVIL ENGINEERING

CE3502- STRUCTURAL ANALYSIS-1

UNIT-4- FLEXIBLITY METHOD

2 MARKS QUESTIONS

S.No	QUESTIONS	CO'S
1.	**Find degree of indeterminacy of the following.**  Degree of indeterminacy = No. of reactions – No. of condition equations = (3 + 2 + 3) – 3 = 5	**CO4**
2.	**Define kinematic redundancy.** When a structure is subjected to loads, each joint will undergo displacements in the form of translations and rotations. Kinematic redundancy of a structure means the number of unknown joint displacement in a structure.	**CO4**
3.	**Give the mathematical expression for the degree of static indeterminacy of rigid jointed plane frames.** Degree of static indeterminacy = (No. of closed loops x 3) – No. of releases	**CO4**
4.	**What are the properties which characterize the structure response by means of force- displacement relationship?** Each element of a flexibility matrix represents a displacement at a coordinate (i) due to a force at a coordinate (j). If the matrix of the structure is known, we know the behaviour of the structure.	**CO4**
5.	**What are the conditions to be satisfied for determinate structures and how are indeterminate structures identified?** • Determinate structures can be solving using conditions of equilibrium alone (H = 0; V = 0; M = 0). No other conditions are required. • Indeterminate structures cannot be solved using conditions of equilibrium because (H ≠ 0; V ≠ 0; M ≠ 0). Additional conditions are required for solving such structures.	**CO4**

<table>
<tr><td>6.</td><td>Write down the equation for the degree of static indeterminacy of the pin-jointed frames, explaining the notations used.
Total indeterminacy = External indeterminacy + Internal indeterminacy
External indeterminacy = No. of reactions – No. of equilibrium equations
Internal indeterminacy = m –(2 j -3)</td><td>CO4</td></tr>
<tr><td>7.</td><td>Differentiate pin-jointed plane frame and rigid jointed plane frame.
<table><tr><th>S.No</th><th>Pin jointed plane frame</th><th>Rigid jointed plane frame</th></tr><tr><td>1</td><td>The joints permit change of angle between connected members.</td><td>The members connected at a rigid joint with maintain the angle between them even under deformation due to loads.</td></tr><tr><td>2</td><td>The joints are incapable of transferring any moment to the connected members and vice-versa.</td><td>Members can transmit both forces and moments between themselves through the joint.</td></tr><tr><td>3</td><td>The pins transmit forces between connected members by developing shear.</td><td>Provision of rigid joints normally increases the redundancy of the structures.</td></tr></table></td><td>CO4</td></tr>
<tr><td>8.</td><td>Mention any two methods of determining the joint deflection of a perfect frame.
1.Unit load method
2.Virtual work method
3.Slope deflection method
4.Strain energy method</td><td>CO4</td></tr>
<tr><td>9.</td><td>What are the requirements to be satisfied while analyzing a structure?
The three conditions to be satisfied are:
(i) Equilibrium condition
(ii) Compatibility condition
(iii) Force displacement condition</td><td>CO4</td></tr>
<tr><td>10.</td><td>What is meant by force method in structural analysis?
A method in which the forces are treated as unknowns is known as force method. The following are the force methods:
• Flexibility matrix method
• Consistent deformation method
• Claypeyron's 3 moment method
• Column analogy method</td><td>CO4</td></tr>
</table>