B. Tech.
(SEM. V) (ODD SEM.) EXAMINATION, 2010-11
STRUCTURAL ANALYSIS - II

Time : 3 Hours]
[Total Marks : 100

Note : Attempt all questions.

1. Attempt any four parts:
   (a) Write the assumptions considered in fully plastic moment of the second.
   (b) Write short note on plastic hinges.
   (c) Explain in brief displacement matrix method.
   (d) Draw the influence line diagram for a simply supported beam carrying unit load at mid span.
   (e) Find out the maximum deflection for a fixed beam with central point load.
   (f) Find out the shape factor of diamond section.

2. Attempt any four parts:
   (a) Write the limitations of load factor methods.
   (b) A beam of span 6 m is to be designed for an ultimate U.D.L. of 25 kN/m. The beam is simply supported at the ends. Design a suitable I-section using plastic theory, assuming permissible stress = 250 N/mm².
   (c) Write the functions of stiffening girders.
   (d) Discuss the differences between two and three hinged stiffening girders.
3. Attempt any two parts:

(a) Develop the flexibility matrix for the cantilever with coordinates as shown in figure.

\[ \text{(Coordinates)} \]

\[ \begin{array}{c}
1 \\
2 \\
3 \\
\end{array} \]

\[ \begin{array}{c}
[1] \\
[2] \\
[3] \\
\end{array} \]

(b) A continuous beam ABCD, 20 m long is simply supported at its ends and is propped at the same level at B and C as shown. It is loaded as shown in fig. If the support B is sink by 10 mm, analyse the beam by moment distribution method and sketch the bending moment diagram. Take \( E = 2.1 \times 10^5 \) N/mm² and \( I = 85 \times 10^5 \) mm⁴.

\[ \begin{array}{c}
A \\
B \\
C \\
D \\
\end{array} \]

- 8kN
- 5kN
- 1kN/m

(c) Analyse the portal frame loaded as shown in figure by the slope deflection method and sketch the bending moment diagram.
4  Attempt any two parts.

(a) A cantilever beam AB of length L is loaded with a point load W at its free end. Using strain energy, find the deflection at the free end.

(b) A suspension cable of 75 m horizontal span and central dip 6 m has a stiffening girder hinged at both ends. The dead load transmitted to the cable including its own weight is 1500 kN. The girder carries a live load of 30 kN/m uniformly distributed over the left half of the span. Assuming the girder to be rigid, calculate the shear force and bending moment in the girder at 20 m from the left support.

(c) Determine the collapse load for the frame shown in figure. M_p is the same for all members.
Attempt any two parts.

(a) Find the forces in the member of the truss as shown in fig. using displacement matrix method. $AE$ and $I$ for all members are tabulated below.

<table>
<thead>
<tr>
<th>Member</th>
<th>$AE$ (MN)</th>
<th>$I$ (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD, CD</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>BD</td>
<td>259.8</td>
<td>259.8</td>
</tr>
</tbody>
</table>

(b) Find the collapse load $W_c$ for the continuous beam as shown in fig. The beam has uniform plastic moment $M_p$.

(c) Drive an expression for horizontal thrust for two hinged parabolic arch having UDL throughout its length.