M.Tech.
PLASTIC ANALYSIS AND DESIGN OF STEEL STRUCTURES
SUBJECT CODE : CE - 506
Paper ID : [E0846]
[Note: Please fill subject code and paper ID on OMR]

Time: 03 Hours
Maximum Marks: 100

Instruction to Candidates:

1) Attempt any Five questions.
2) All questions carry equal marks.

Q1) (a) A rectangular section has 200mm \( \times \) 400mm cross-section. Determine plastic section modulus and load factor.
(b) For the section shown, find the shape factor. Take \( F_y = 250 \) MPa and FOS = 1.62.

\[
\begin{align*}
N & \quad A \\
2h & \quad B
\end{align*}
\]

Q2) Compute the ultimate load for the continuous beam loaded and supported as under. Perform the moment balancing operation. Draw B.M.D. Take \( EI = \) constant.

\[
\begin{align*}
L & \quad L \quad L \\
W & \quad W \quad W
\end{align*}
\]

Q3) Explain the concept of minimum weight design. Explain theorems associated with minimum weight design of steel structures. How do you apply technique of linear programming to minimum weight design problems.
Q4) (a) A fixed beam is subjected to udl ‘w’ acting throughout the span. Using mechanism method, compute the ultimate load.

(b) A fixed beam is subjected to a concentrated load ‘w’ at \( \frac{L}{3} \) from one end. Compute ultimate deflection.

Q5) Compute ultimate load for the frame shown. Also draw B.M.D.

Q6) (a) Enumerate the factors on which fully plastic moment is dependent. Discuss influence of shear force on fully plastic. Moment of a beam of rectangular section.

(b) Explain Kinematic theorem of incremental collapse.

Q7) For the pitched slope portal frame shown, locate instantaneous centre of rotation. Determine value of Mp for complete collapse.
Q8) Write about the following:

(a) Shake Down Analysis.

(b) Special considerations for design of structures using light gauge metals.

(c) Relationship between degree of redundancy and number of hinges necessary to convert a framed structure into a mechanism.