Menoufia University

Faculty of Engineering

Shebin El-Kom

Academic Year: 2019-2020



Department: Civil Eng.

Year: Level 700

Subject: Nonlinear Dynamic analysis of Frame

Structures Structure
Time Allowed: 3 hours
Date: 17/8/2020

Allowed Tables and Charts: (None or e.g. Steam Tables)

Answer all the following Questions

O(1) [20]

- a) Explain the formation of the plastic hinge in a simple-supported beam.
- b) Define the nanlinear analysis, define the shape factor and identify the the shape factor for a rectangular cross-section.
- c) Explain the process of yielding of a section
- d) Determine the lower bound (Safe) theorem
- e) Explain the difference between
 - The mechanical hinge and the plastic hinge
 - The elastic and plastic material
 - Working bending moment, yielding bending moment and plastic bending moment.

Q2[20]

Find the ultimate load for the beam presented in Fig. 1 using the equilibrium method and virtual work method (Mp= 30 t.m).

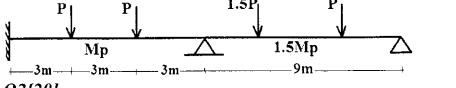


Fig. 1

Q2[20]

Find the plastic moment for the beam presented in Fig. 2 using the equilibrium method and virtual work method.

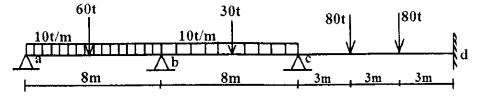


Fig. 2

<u>Q4[20]</u>

Find the plastic moment for the beam presented in Fig. 2 using the equilibrium method and virtual work method.

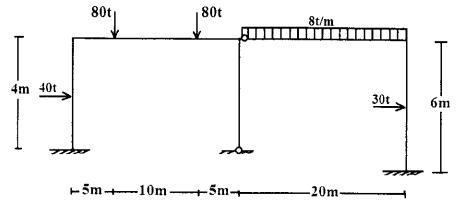


Fig. 4

<u>Q5[20]</u>

If the base shear force was distributed to lateral forces at the two stories and the three stories frames presented in Fig. 5, find the plastic moment of the two frames.

