QUESTIONS FROM PREVIOUS EXAMS– SET #1

1) Determine the support reactions and internal forces in members 1 and 3 of the truss structure loaded as shown below.

2) Draw the axial force, shear force, and bending moment diagram for the structure shown below using the axes provided. Note the presence of a hinge in the structure.

3) Draw the axial force, shear force, and bending moment diagram for the structure shown below using the axes provided.

4) Find the vertical deflection of the beam at point $P$. Assume that $EI$ of the beam is constant.
5) Find the reactions and member forces in the truss structure shown below. The truss has a pinned-support at B and a roller-support at D. A pair of downward concentrated loads of 40 kip are applied on the truss at joints A and C.

![Truss Diagram](image)

6) The beam shown below has a fixed-support at P, a roller-support at S, and an internal hinge at R. It is loaded with a 40 kip-ft clockwise external moment at its free end T and with a 5 kip downward concentrated load at Q which is half-way between the fixed-support and the internal hinge.

   a) Find the reactions at supports P and S.
   b) Draw the shear force diagram.
   c) Draw the bending moment diagram.

![Beam Diagram](image)

7) The truss shown below has a pinned-support at B and a roller-support at F. A 4k downwards point load is acting on the truss at node D. Find the forces in members AB, BC, and CD.

![Truss Diagram](image)
8) The beam shown below has a pinned-support at $B$ and a roller-support at $C$. The beam is loaded at its free-end $A$ with a horizontal point load ($2k$) and a moment ($40\ k\cdot\text{ft}$), and at mid-point between $B$ and $C$ with a vertical point load ($10\ k$), as illustrated.

a. Find the support reactions.
b. Draw the axial force diagram.
c. Draw the shear force diagram.
d. Draw the bending moment diagram.
e. Sketch the deflected shape. Consider flexural response only; assume constant $EI$.

![Beam Diagram](image)

9) The portal frame shown below has pinned-supports at $A$ and $D$. The joint at $B$ is rigid. The frame has an internal frictionless hinge at $C$. A horizontal point load $P$ is acting on the frame at $B$.

a. Find the support reactions.
b. Draw the axial force diagram.
c. Draw the shear force diagram.
d. Draw the bending moment diagram.

![Portal Frame Diagram](image)
10) Determine the rotation at B and the deflection at C. Note that the moment diagram for the original structure is given. EI is constant.

11) The beam $ABCD$ is made of two segments connected by an internal frictionless hinge at $B$. Segment $AB$ has twice the $EI$ of segment $BCD$, $2EI_o$ vs. $EI_o$, as indicated on the figure below. The beam has fixed support at $A$ and has an internal roller support at $C$. Consider flexural response only.

   a. Draw the bending moment diagram.

   Find the following:

   b. the vertical displacement at $B$;
   c. the slope of the beam segment $AB$ at just to the left of the frictionless hinge at $B$;
   d. the slope of the beam segment $BCD$ at just to the right of the frictionless hinge at $B$;
   e. vertical displacement at $D$.

   f. Sketch the deflected shape.