

PROBLEM STATEMENT: A HORIZONTAL BEAM OF LENGTH $3a$ IS SHOWN BELOW. THIS BEAM HAS A PIN SUPPORT AT THE LEFT END OF THE BEAM AND A ROLLER SUPPORT $2a$ FROM THE LEFT END OF THE BEAM. A $3P$ LOAD IS APPLIED a FROM THE LEFT END OF THE BEAM AND A LOAD P IS APPLIED AT THE RIGHT END OF THE BEAM. CAN USING FIRST THE DIRECT INTEGRATION METHOD AND THEN USING SINGULARITY FUNCTIONS DETERMINE EXPRESSIONS FOR THE SHEAR FORCE, BENDING MOMENT, CURVATURE, AND DISPLACEMENT IN THIS BEAM. DRAW THE SHEAR FORCE, BENDING MOMENT, CURVATURE, AND DISPLACEMENT DIAGRAMS; AND LABELING ALL CRITICAL VALUES AND THEIR LOCATIONS.

GIVEN:

1. A BEAM OF LENGTH $3a$ (EI)
2. A TRANSVERSE LOAD OF $3P$ a FROM THE LEFT END OF THE BEAM
3. A TRANSVERSE LOAD OF P AT THE RIGHT MOST END OF THE BEAM
4. A PIN CONSTRAINT AT THE LEFT MOST END OF THE BEAM
5. A ROLLER SUPPORT $2a$ FROM THE LEFT END OF THE BEAM

ASSUMPTIONS:

1. THE BEAM IS INITIALLY STRAIGHT
2. THE MATERIAL IS LINEAR ELASTIC
3. ALL DISPLACEMENTS ARE SMALL.

FIND:

1. USING DIRECT INTEGRATION DETERMINE EXPRESSIONS FOR $V, M, \theta, \delta u$
2. USING SINGULARITY FUNCTIONS DETERMINE EXPRESSIONS FOR $V, M, \theta, \delta u$
3. DRAW THE $V, M, \theta, \delta u$ DIAGRAMS.

FIGURE:



