PVP 12

Code: ME4T1

II B.Tech - II Semester – Regular Examinations - JUNE 2014

MECHANICS OF SOLIDS II
(MECHANICAL ENGINEERING)

Duration: 3 hours Marks: 5x14=70

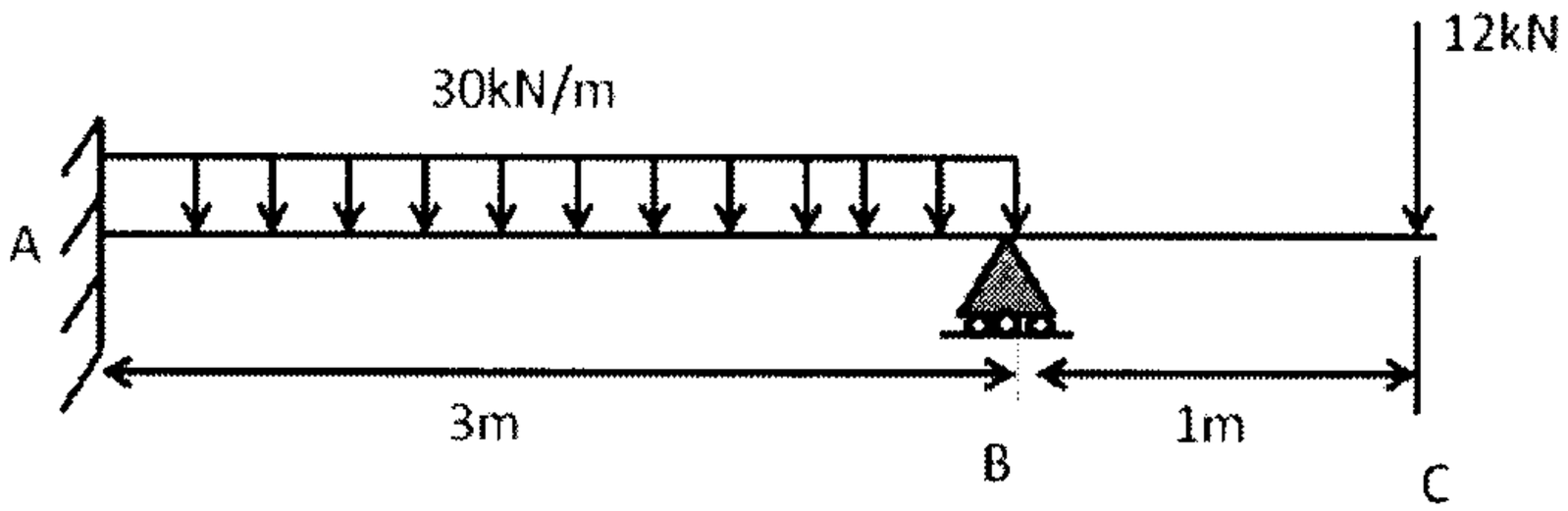
Answer any FIVE questions. All questions carry equal marks

1. a) State and explain mathematical expressions related to Moment Area Theorem I and II? 4 M

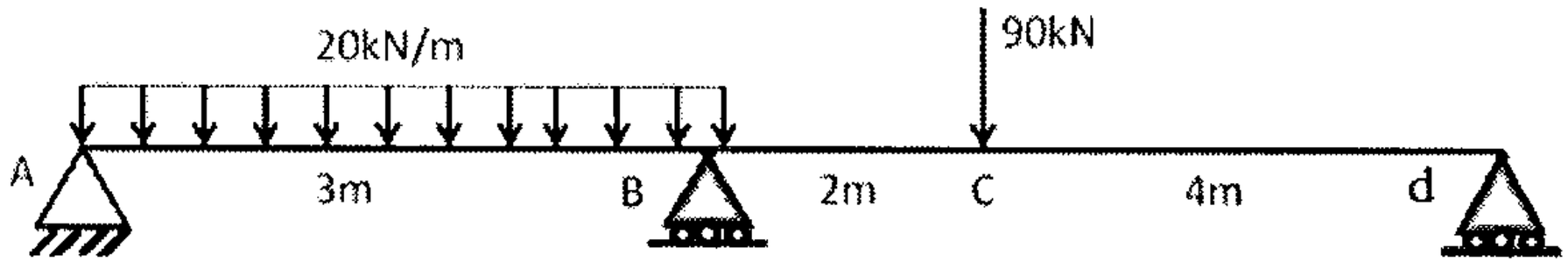
   b) A beam of 10m long is supported at its left end and at 8m from this end. The beam carries loads as follows: a uniformly distributed load of 32kN/m for a length of 4m from the left end, a point load of 10kN at 6m from the left end, and a point load of 20kN at the right end (free end).
      i) Calculate the slope at the supports? 6 M
      ii) Deflection at midpoint between the supports if EI is constant? 4 M

2. a) When will you say beam is statically indeterminate? Give at least two examples related to statically indeterminate beams with free body diagrams? 4 M

   b) Using Moment area method, determine the reactions for the propped cantilever beam shown in the figure? 10 M



3. Analyze a continuous beam as shown in the figure? Calculate the support reactions and also draw Shear force diagram and bending moment diagram? 14 M



4. a) Derive an expression for Euler's load when both the ends of the column are fixed and also write the assumption required to derive that expression? 8 M

b) Compare the Euler's crippling load of two columns one of solid circular section and the second of hollow section of internal diameter 70% of the external diameter if they are of the same material, same length, same area and same end conditions? 6 M

5. a) Draw the Mohrs circle for Pure shear? And find the planes at which we have maximum normal stress and its magnitude? 4 M

b) An element in a plane stress is subjected to stresses
σ_x = -120 MPa σ_y= 80MPa τ_{xy} = -40MPa.

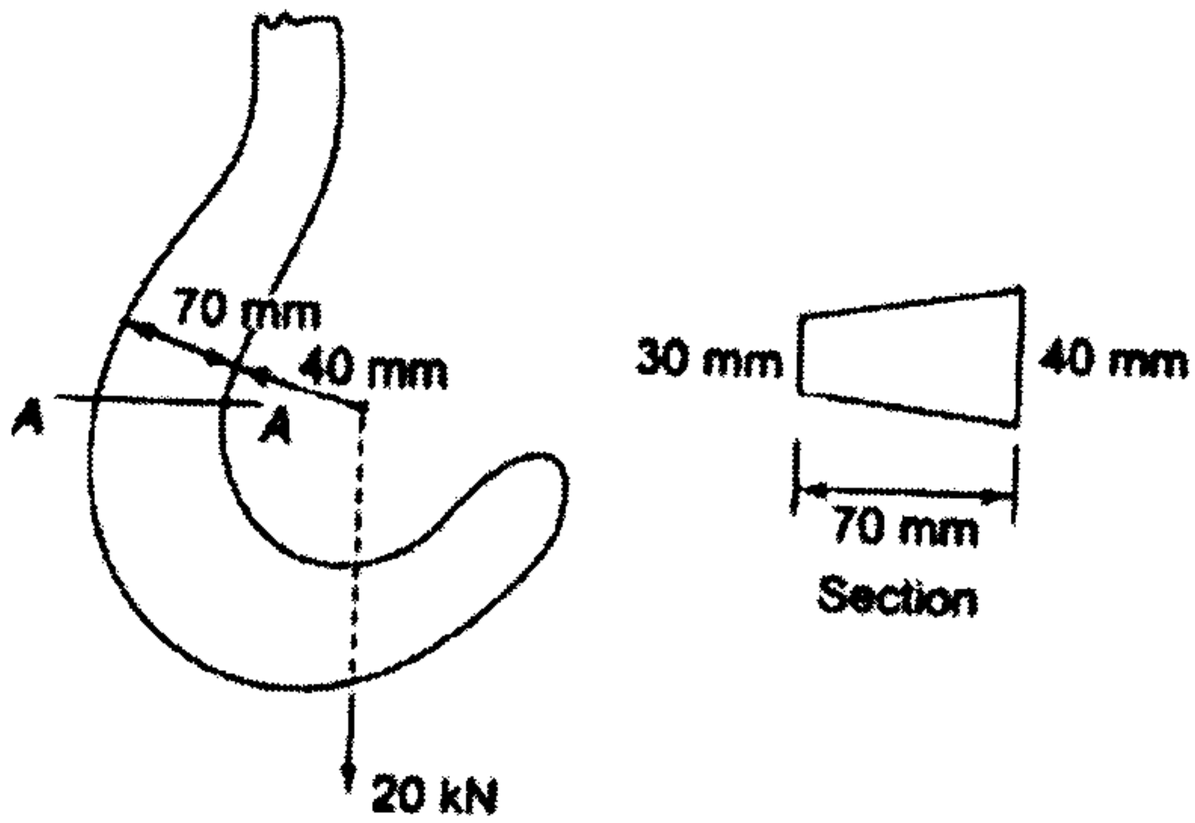
i. Calculate the principal stresses and corresponding planes. 5 M

ii. Calculate the Maximum shear stresses and corresponding planes. 5 M

6. A compound cylinder is made by shrinking a jacket on to a cylinder. For compound cylinder, the outer and inner radii are 100mm and 60mm and the radius at the junction is 80mm. Before the fluid pressure of 40MPa is applied, the radial pressure at the junction is 10MPa. Determine the final stresses in the cylinder. Also calculate the differences in the diameters of the tubes before the jacket is shrunk on to the cylinder and the temperature at which this can be done. Take E=200GPa and α=12x10^{-6} /°C, ν=0.3? 14 M

7. A flat steel turbine disk of 75cm outside diameter and 15cm inside diameter rotates at 3000rpm, at what speed the blades and shrouding cause a tensile rim loading of 4312kPa. The maximum stress at this speed is to be 114MPa. Find the maximum shrinkage allowance on the diameter when the disk and the shaft are rotating. 14 M

8. A crane hook of trapezoidal section as shown in the figure. For loading shown calculate



Location of neutral axis?	5 M
Maximum and minimum stress?	5 M
Plot the variation of stress across the section?	4 M