

SUBJECT: MECHANICS OF SOLIDS

Day: Tuesday  
Date: 14/05/2019

S-2019-2554

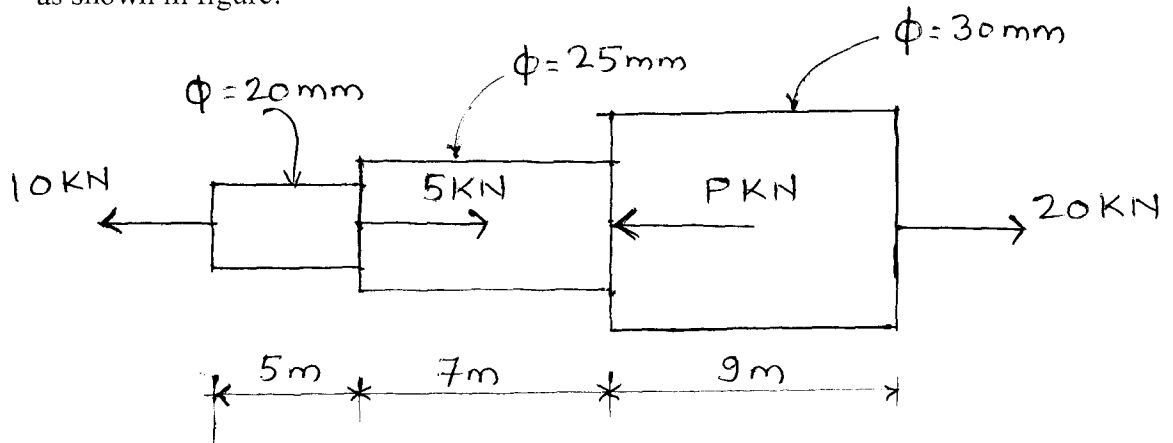
Time: 02.30 PM TO 05.30 PM  
Max Marks. : 60

N.B. :

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Assume suitable data, if necessary.
- 4) Use of non programmable calculator is **ALLOWED**.
- 5) Draw neat and labeled diagrams **WHEREVER** necessary.

Q.1 a) Define : (05)  
 i) Hooke's law with it's proof  
 ii) Modulus of rigidity and strain

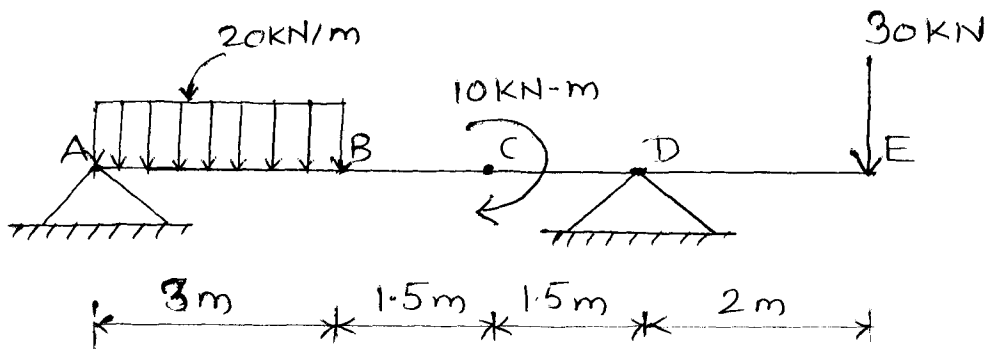
b) Determine the magnitude of p for equilibrium and total elongation of the bar (05) as shown in figure.



OR

Q.1 A copper wire  $20\text{mm}^2$  in cross section and steel wire  $30\text{mm}^2$  in cross section (10) both 1m long are rigidly connected to plates on either side. They jointly share a load of 8 kN.  
 $E_{\text{steel}} = 20 \times 10^5 \text{ Mpa}$  and  
 $E_{\text{copper}} = 1 \times 10^5 \text{ Mpa}$   
 Find stresses produced in each material.

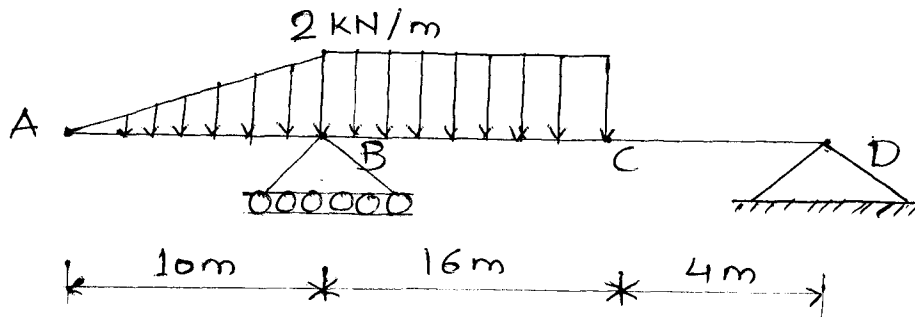
Q.2 Draw S.F.D. and B.M.D. on shown in figure. Also locate the points of (10) inflection.



P.T.O.

OR

- Q.2 Draw S.F.D. and B.M.D. Also find pt. of contra-flexure. (10)



- Q.3 State four assumption of pure bending. A circular beam of 120mm diameter is simply supported over a span of 10m and carries a u.d.l. of 1000N/m. Find the maximum bending stress produced. (10)

OR

- Q.3 A simply supported beam of span L subjected to the central point load 'W'. Determine maximum slope and deflection. (10)

- Q.4 An I – section beam 350 mm × 200mm has a web thickness of 12.5 mm and a flange thickness of 25 mm. It carries a shearing force of 200 kN at a section. Sketch shear stress distribution across the section. (10)

OR

- Q.4 Determine the size of solid shaft to transmit 200 kW with max. shear stress of 70 Mpa. If the shaft rotates at 20 rpm and at 20000rpm. (10)

- Q.5 Derive an expression for crippling load when both the ends of the column are hinged. (10)

OR

- Q.5 What is concept of direct and bending stresses? A hollow steel tube of 200 mm external diameter and 25 mm thick is 4 m long and used as a column. If one end is fixed and other end is hinged. Find the load the column can carry. Factor of safety as 2. (10)

- Q.6 At a point in a strained material the normal stresses acting are + 50 Mpa and – 30 Mpa at a plane right angle to each other with a shear stress of 20Mpa. Determine : (10)
- Principal stresses and their nature
  - Normal and tangential stress on a plane inclined at angle of  $25^\circ$  with the plane of + 50Mpa.

OR

- Q.6 A cylinder 500 mm internal diameter and 20 mm wall thickness with closed ends is subjected to an internal pressure of 0.60 Mpa, bending moment 64000 N-m and torque 16000 N-m. Determine tensile stress and shearing stress in the wall of the cylinder. (10)

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