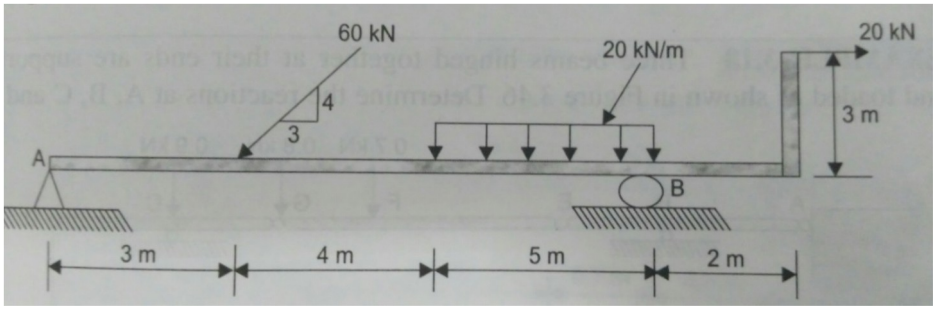
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2018

Programme:	**B. Tech. (Fire and Safety)**	**Semester –**	**IV**
Course Name:	**Strength of Materials**	**Max. Marks**	**: 100**
Course Code:	**GNEG 227**	**Duration**	**: 3 Hrs**
No. of page/s: 02			

Section A (all the questions are mandatory) (7.5*4 = 30)

1. Determine the reactions of the overhang beam as shown in figure.



2. A 2 m long steel bar is having uniform diameter of 50 mm tor a length of 1.2 m and in remaining length, diameter gradually reduces from 50 mm to 25 mm. Determine the elongation of bar when subjected to an axial tensile load of 100 kN. Assume E = 2*10^5 N/mm^2.

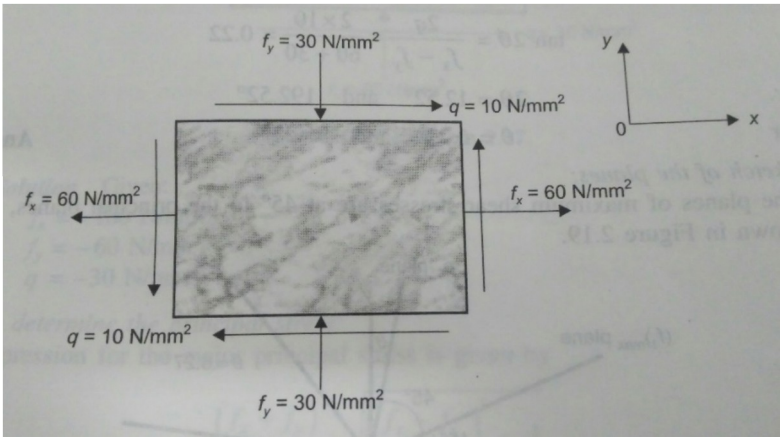
3. Show that in a strained material subjected to two-dimensional stress, the sum of the normal components of the stresses on any two mutually perpendicular plane is constant.

4. The following observations were made during a tensile test on a mild steel specimen of 40 mm diameter and 200 mm long:
   a. Elongation with 40,000 N load = 0.0304 mm
   b. Yield Load = 165,000 N
   c. Maximum load = 245,000 N
   d. Length of specimen at fracture = 252 mm

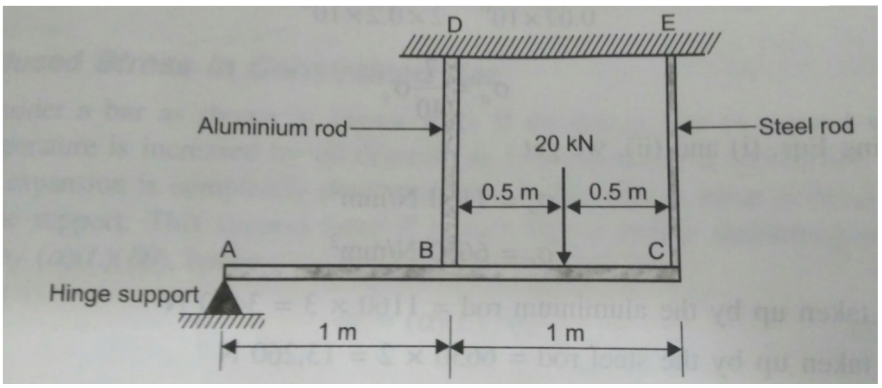
   Determine the yield stress, the modulus of elasticity, the ultimate stress and the percentage elongation.

Section B **(15*3 = 45)**

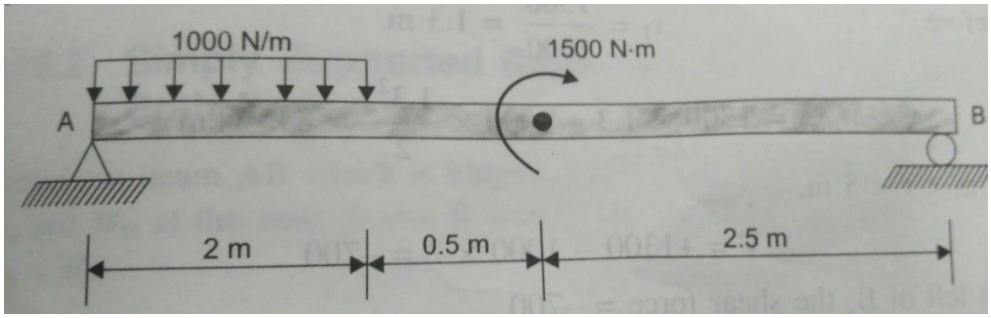
5. A plane element is subjected to stresses as shown in figure. Determine the principle stresses, the maximum shear stress and their plane. Sketch the planes determined.



6. As shown in figure, a rigid bar ABC hinged at A and suspended at two points B and C by two equal bars BD and CE made of aluminum and steel respectively. The bar carries a load of 20 kN midway between B and C. The cross sectional area of the aluminum bar is 3 mm^2 and that of steel bar is 2 mm^2. Determine the load taken by two bars.
Assume modulus of elasticity of aluminum = 0.07*10^6 N/mm^2 and modulus of elasticity of steel = 0.2*10^6 N/mm^2.

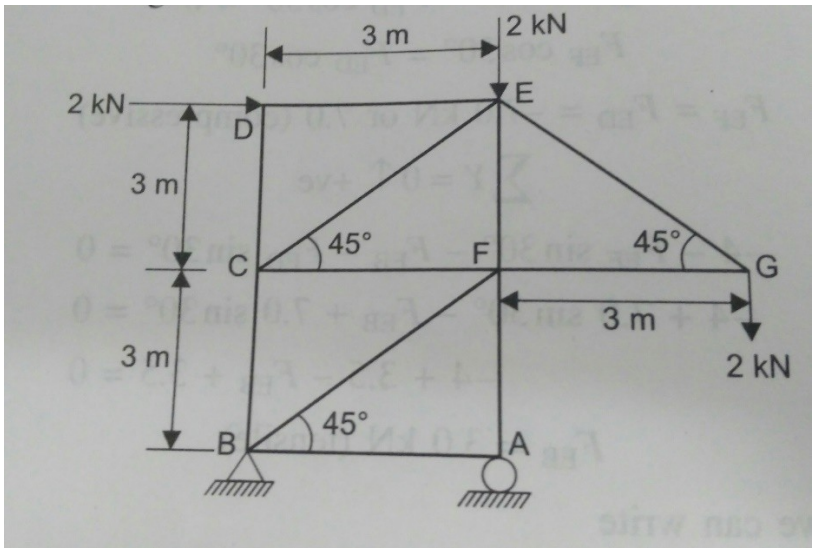


7. A 5 m long simply supported beam at each end has a uniformly distributed load of 100 N/m extending from the left end to a point 2 m away as shown in figure. There is also a clockwise couple of 1500 N-m applied at the centre of the beam. Draw the shear force and the bending moment diagrams for the beam and find the maximum bending moment. Neglect the weight of the beam.


1000 N/m
1500 N·m
A
B
2 m
0.5 m
2.5 m

Section C (Q. no. 8 is having internal choice) **(25*1 = 25)**

8. Find the method of joints of the forces in the members of the truss shown in figure:



OR

Determine the forces in the various members of the cantilever truss shown in figure using method of joints.