Ex/CHE/AM/ME/T/3/2017

Bachelor of Chemical Engineering

1st year 2nd semester Examination 2017

Subject : Strength of Materials

F.M. =100 Time =3 hrs

Answer any five questions

1 (a) Refer to Fig A and find out the change in length in each segments of the bar.

(b) Find out the elongation of the conical rod with base diameter d, height h, young's modulus E and specific weight w due to its self weight (Fig B). 10+10

2 (a) Deduce the expression of angle of twist, $\theta = TL/GJ$ mentioning all necessary assumptions.

(b) A hollow steel shaft having outside diameter d and inside diameter d/2 transmits 300 KW at 120 rpm. If the maximum shear stress is 50 N/mm^2, find out the shaft diameter. 10+10

3(a) Deduce the expression of circumferential and longitudinal stresses for a thin walled cylindrical pressure vessel.

(b) A spherical shell of 90 mm internal diameter has to withstand an internal fluid pressure of 35 MPa. Find out the thickness of the vessel, if the maximum permissible tensile stress is 80 MPa and joint efficiency is 85 % . 10+10

4 Refer to fig C and draw Mohr's circle. From the Mohr's circle find out normal stress and shear stress on the inclined plane shown in the figure. Also find out the principal stresses and the identify the principal planes. (Use Graph sheet) 20

5. (a) Refer to Fig D and draw the shear force and bending moment diagrams.

[Turn over

(b) A simply supported beam with a span of 5 m carries a uniformly distributed load of 10 N/m. The beam has a rectangular cross section with depth h and width h/2. If the allowable bending stress is 150 MPa, find out h. 10+10

6 (a) Refer to Fig E and find out the deflection at the free end.

(b) Deduce the expression for critical buckling load of a both side pin ended column. 10+10

7 Write short notes on any four : 4 X 5

(a) Closed coil helical spring

(b) Slenderness ratio

(c) Williot diagram

(d) Flexural rigidity and torsional rigidity

(e) Point of contraflexure

$P_1 = 30\ KN$
$P_2 = 60\ KN$
$E = 200\ GPa$

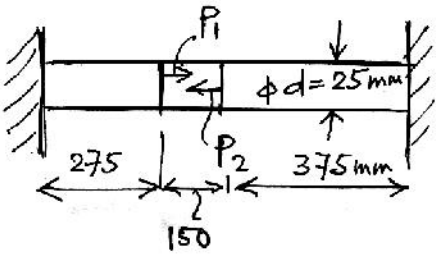

Fig. A

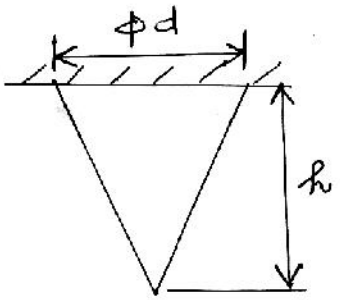

Fig. B.

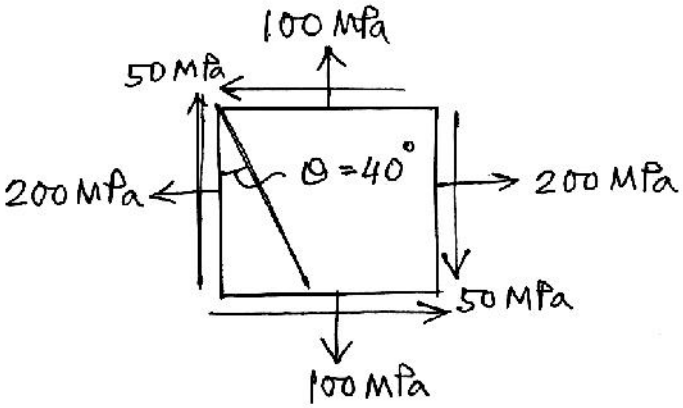

Fig C

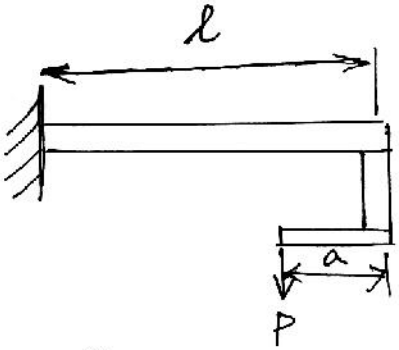

Fig D.

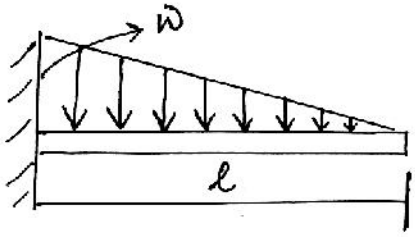

Fig E.