Registration No: | | | | | | | | | | |

Total Number of Pages: 03

M.TECH
P1MEBC04

1st Semester Regular Examination 2016-17
Advanced Mechanics of Solid
Branch: HPT, MD, POEM
Time: 3 Hours
Max Marks: 100
Q Code:Y853

Answer QuestionNo.1which is compulsory and any four from the rest. The figures in the right hand margin indicate marks.

Q1 Answer the following.

a) Write down Winkler-bach formula. Name each term. Where it is used? (2)

b) What is the significance of shear centre. (2)

c) What is meant by beams on elastic foundation give one example? (2)

d) Write assumptions of Kirchhoff for thin plate theory. (2)

e) State the position of maximum and minimum circumferential and radial stresses in a solid rotating disc. (2)

f) What is meant by lame's theory of thick cylinder. State the assumptions of lames theory. (2)

g) State the Euler's critical load in a case where Column with one end fixed and the other end free. State each term of the expression. (2)

h) What is warping function in torsion of non circular bars? (2)

i) Define the normal and shear stress components (2)

j) What is lame's theory of thick cylinder. State the assumptions involved. (2)

Q2 a) Derive an expression for radial, tangential and shear strain in 2D polar coordinate. (12)

b) If the displacement field is given by (8)
$\mathbf{u} = [y^2\mathbf{i} + 3yz\,\mathbf{j} + (4 + 6x^2)\mathbf{k}]10^{-2}$,what are the rectangular strain components at the point P(1, 0, 2)?

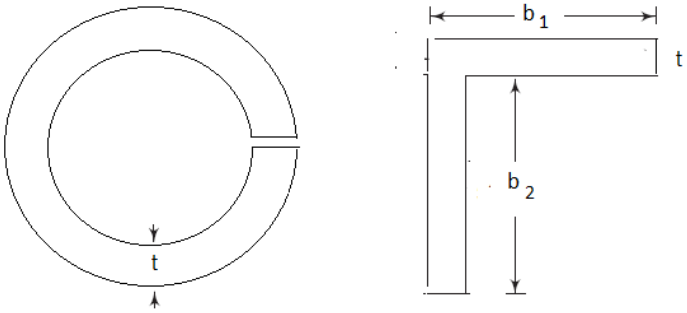
Q3 a) Stress tensor at a point is given by (10)

$$\sigma_{ij} = \begin{bmatrix} 1 & 2 & 1 \\ 2 & -2 & -3 \\ 1 & -3 & 4 \end{bmatrix}$$

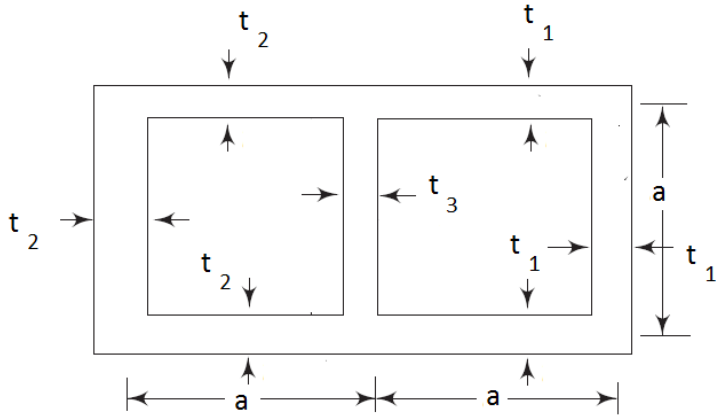
all in units of kPa. Find the principal stresses and check for invariance.

Q3 b) Derive the diffrential equation of equilibirium for 3D state of stress on a body in rectangular co-ordinate system. (10)

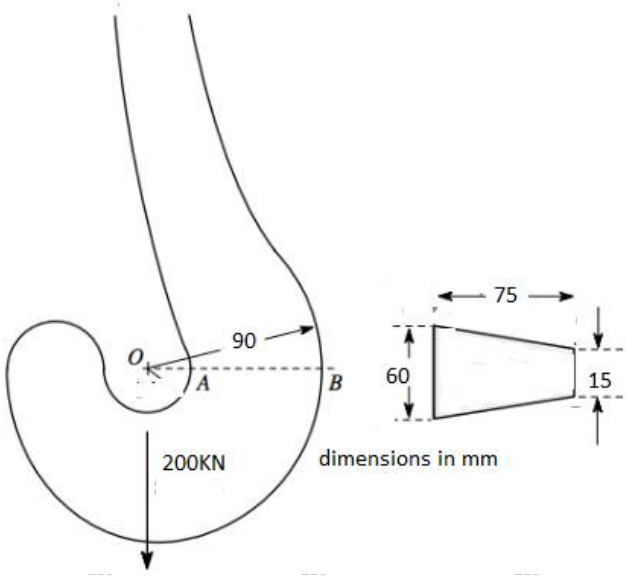
Q4 a) Compare the stiffness and maximum stress of the two sections having same thickness "t" and if (b_1+b_2) of L-section is equal to the circumference of the circular open section having outer radius as 'r'. (10)



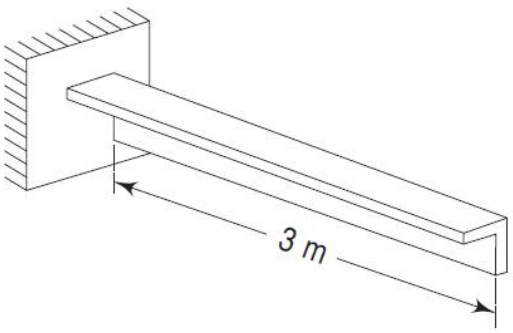
b) Below figure shows a two-cell tubular section whose wall thicknesses are as shown. If the member is subjected to a torque T, determine the shear flows and the angle of twist of the member per unit length in terms of torque T. (10)

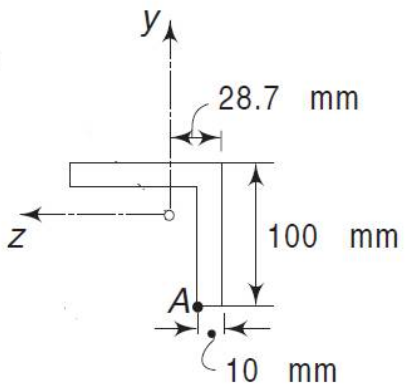


Q5 a) Find out the stresses at point A and B. (10)



Q5 b) A beam of equal-leg angle section, shown in figure below, is subjected to its own weight. Determine the stress at point A near the built-in section. It is given that the beam weighs 1.48N/cm. Given:.,I_{zz}=180cm^4I_{zy}=106.57cm^4 (10)





Q6 a) Find the maximum value of hoop and radial stress for a rotating disc of internal diameter 160mm and external diameter 320mm. The disc is rotating at 2000 rpm. for the disc material, density ρ = 7000 kg/m3 and v=0.3. (8)

b) Derive the expression for radial and circumferential stresses induced in a thick cylinder which is subjected to internal pressure alone. Draw also the stress profiles. (12)

Q7 Write short notes on: (5x4)

a) Virtual work

b) Hamilton's principle

c) Bending and unsymmetrical bending.

d) Thin shells