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Total Number of Pages: 2

B.Tech
PCCI4303

5th Semester Regular / Back Examination 2016-17
ADVANCED MECHANICS OF MATERIALS

BRANCH: CIVIL

Time: 3 Hours

Max Marks: 70

Q.CODE:Y457

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: (2 x 10)

- a) Define *stress concentration factor*.
- b) State maximum strain theory.
- c) Draw the stress strain curve for mild steel showing the salient features.
- d) State two assumptions of bending as per Winkler-Bach's theory.
- e) Distinguish between *plane stress* and *plane strain* condition?
- f) State the theories of failures that are suitable only for ductile materials.
- g) The principal strains (ϵ_1, ϵ_2) are given as 272×10^{-6} and 34×10^{-6} , $E = 210 \text{ GPa}$, $\mu = 0.3$. Calculate the principal stresses.
- h) State stress optic law.
- i) What do you understand by the term *unsymmetrical bending*.
- j) How thick cylinder differs from a thin cylinder.

Q2 Derive the equations for circumferential and radial stress developed in thick walled cylinder under plane stress condition subjected to external and internal pressure with boundary conditions. Assume proper symbols of the variables used. (10)

Q3 a) Derive the equilibrium equations in three dimensional states of stress problems. (5)

b) Derive the strain compatibility equations. (5)

Q4 a) Explain maximum principal strain theory and Tresca's theory. (5)

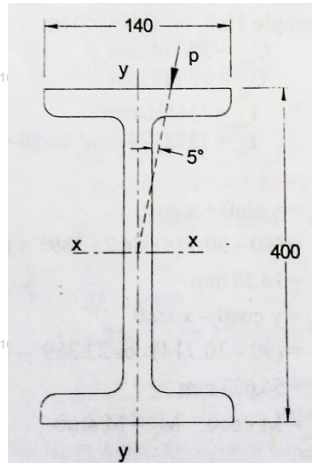
b) Two of the principal stresses at a point are 130 N/mm^2 and 90 N/mm^2 . Determine the safe range of third principal stress at the point by Maximum strain energy theory and Maximum distortion energy theory. Take $E = 2 \times 10^5 \text{ N/mm}^2$, failure stress in tension test to be 210 N/mm^2 , and $\mu = 0.25$. Assume that, the failure stresses in tension and compression are same. (5)

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Q5 a) What do you mean by a *compound cylinder*? (3)

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b) A thick cylinder with internal diameter 150mm and external diameter 300mm is fixed on the outer circumference. Determine the stresses at outside and inside surface if it is subjected to an internal fluid pressure of 130 KN/mm^2 . Assume $\mu=0.3$. (7)

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Q6 a) Explain deflection of beams due to unsymmetrical bending. (3)

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b) (7)



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An Indian Standard I-section ISMB 400 has the following properties.

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Depth of I section = 400 mm

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Width of I section = 140 mm

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 $I_{xx} = 204.584 \times 10^6 \text{ mm}^4$

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 $I_{yy} = 6.221 \times 10^6 \text{ mm}^4$

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Determine the percentage increase in stress at right hand top corner of the section if the plane of loading is 5° to vertical compared to exactly vertical loading.

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Q7 a) What do you mean by *shear center*? (3)

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b) Determine the shear center for a symmetrical I section. (7)

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Q8 Write short answer on any TWO: (5 x 2)

210 210 210 210 210 210 210 210
a) Fatigue in metals

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b) Airy's stress function

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c) Strain rosette

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d) Location of shear centre in a channel section