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Total Number of Pages: 02

B.Tech
PCCI4303

5th Semester Examination: 2019-20
ADVANCED MECHANICS OF MATERIALS

BRANCH: CIVIL

Max Marks: 70

Time: 3 Hours

Q.CODE: HB498

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

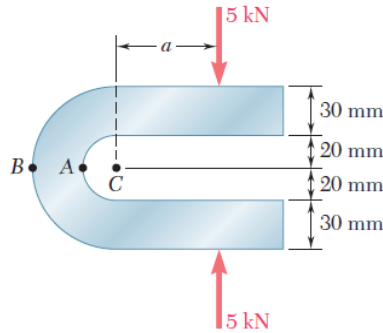
Q1 Answer the following questions: (2 x 10)

- a) What do you mean by plane stress condition? Give example.
- b) Differentiate between symmetrical and unsymmetrical bending.
- c) State maximum shear stress theory.
- d) What is meant by an octahedral plane?
- e) What do you mean by endurance limit?
- f) What do you mean by compound cylinder.
- g) Define shear centre.
- h) Name the type of cross section of a beam which can never be subjected to unsymmetrical bending.
- i) Differentiate between isoclinic and isochromatic fringe pattern.
- j) Define stress concentration factor.

Answer any five out of seven questions

- Q2 a)** At a point in a bar of cast iron, the principal stresses are 60 MPa tensile and 120 MPa compressive whereas the third principal stress is zero. Find the factor of safety based on the elastic limit when the criterion of failure is principal stress theory. Assume the elastic limit of cast iron is 90 MPa in tension and 440 MPa in compression. **(5)**
- b)** Compare the various theories of failure graphically. **(5)**
- Q3 a)** The state of stress at a point is such that $\sigma_x = \sigma_y = \sigma_z = \tau_{xy} = \tau_{yz} = \tau_{zx} = 5$ N/mm². Determine the principal stresses and their directions. **(5)**
- b)** Derive the differential equation of equilibrium for plane stress problem in the presence of body forces. **(5)**
- Q4 a)** A cantilever beam of rectangular cross section is subjected to a load of 1000N at free end. The length, breadth and depth of the beam are 400cm, 4cm and 6cm respectively. The line of action of the load makes 30° with the vertical. Determine the maximum stress in the beam. **(5)**
- b)** Explain the Winkler-Bach theory as applicable to bars of large initial curvature. **(5)**

- Q5** The curved bar as shown in figure has a cross section of 30x30 mm. Knowing that $a=60\text{mm}$, Determine the stress at point A and point B.



- Q6** A compound thick cylinder is formed by shrinking a tube of external diameter 300mm over another tube of internal diameter 150mm. After shrinking, the diameter at the junction of the tube is found to be 250mm and radial compression as 28 MPa. Find the original difference in radii at the junction. Assume $E=200\text{ GPa}$. (10)
- Q7** What is a strain rosette? Derive an expression of three element delta rosette for principal strains and principal stresses. (10)
- Q8** Write short note on any Two: (2 x5)
- Symmetrical bending and unsymmetrical bending.
 - Repeated stresses and fatigue in metals.
 - Write a short note on polariscope.