Registration No :

Total Number of Pages : 02

Course: B.Tech
Sub_Code: PCI4I101

4th Semester Back Examination: 2022-23
SUBJECT: ADVANCED MECHANICS OF SOLIDS
BRANCH(S): CIVIL
Time : 3 Hour
Max Marks : 100
Q.Code : M087
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   Answer the following questions: (2 x 10)
a) State maximum shear stress theory.
b) Define stress concentration factor.
c) Differentiate between thick and thin cylinder.
d) State about plain strain condition.
e) Show graphical representation of maximum principal stress theory.
f) State shear centre. What is its significance?
g) What is a strain gauge?
h) Define fatigue in metals.
i) Define endurance limit.
j) What do you mean by isotropic material?

Part-II

**Q2   Only Focused-Short Answer Type Questions- (Answer Any Eight out of   (6 × 8)
Twelve)**

a) Describe the total strain energy theory.
b) Compare the various theories of failure graphically.
c) Locate the shear centre of a channel section.
d) A pipe of 200 mm internal diameter and 50 mm thickness carries a fluid at a pressure 18 MPa. Calculate the maximum and minimum intensities of circumferential stress across the section.
e) Differentiate between isochromatic and isoclinic fringe pattern.
f) Differentiate between principal stress and principal strain theory.
g) Derive the Winkler – Bach equation for a bar of large initial curvature.
h) The major principal stress on an element of a steel member is 200 N/mm^2 and tensile in nature. The minor principal stress is compressive. If the tensile yield point of steel is 300 N/mm^2, find the minor principal stress at which the failure will occur according to following theories of failure
     a) Maximum strain theory
     b) Maximum strain energy theory

i) A thick cylinder with internal radius of 10 cm and external radius 20 cm is subjected to an internal fluid pressure of 100 MPa. Draw the variation of radial and hoop stresses in the cylinder wall. Also determine the maximum shear stress in the cylinder wall.

j) A cantilever beam of length 400 mm is subjected to a load of 1000 kN at free end which is inclined at an angle 30^0 to vertical. The beam is of rectangular cross section (40 mm width and 60 mm depth). Estimate the maximum bending stress.

k) The three readings on 45^0 strain rosette are $e_a = 300 \times 10^{-6}$, $e_b = -100 \times 10^{-6}$ and $e_c = -200 \times 10^{-6}$. If $E = 200$ kN/mm^2 and $\mu = 0.3$, determine the principal stresses.

l) Differentiate between symmetrical bending and unsymmetrical bending.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 A 4 tonne crane hook has trapezoidal section as shown in fig. Find the circumferential stress σ_A on inside fibers and σ_u on the outside fibers at the section AB. **(16)**

Section at AB
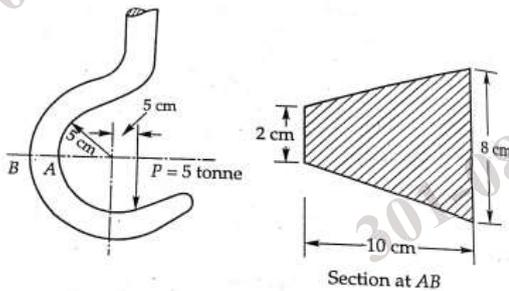
Q4 Write short notes on **(16)**
   a) Polariscope.
   b) Compound cylinder

Q5 Derive the equations of equilibrium and compatibility condition for a three dimensional elastic body. **(16)**

Q6 What is a strain rosette? Derive an expression of three element delta rosette for principal strains and principal stresses. **(16)**