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

Total Number of Pages : 03 **B.Tech**

PME5D001

5th Semester Regular / Back Examination 2018-19

ADVANCED MECHANICS OF SOLIDS

BRANCH : MECH

Time : 3 Hours

Max Marks : 100

Q.CODE : E570

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 **Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) State the importance of advanced mechanics of solid in design and analysis of machine element and structures.

b) State the strain displacement relation of Cauchy.

c) What do you mean by plane strain and plane stress condition?

d) What is Lame's equation and state its significance.

e) What is the significance of hydroststic and deviator stress?

f) State the advantages of compounding thick cylinder and its applications?

g) Discuss the octahedral shear stress and shear strain

h) Why trapezoidal cross section of hook is preferred over rectangular section?

i) What do you mean by stress concentration factor?

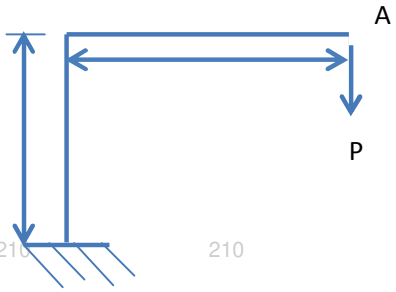
j) State the difference between Lamina and Laminates?

Part- II

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

a) Derive the differential equation of equilibrium in three dimension and state its significance.

b)



The bend ABC carries a concentrated load P vertical at point A. Find the vertical and horizontal deflection at point A.

c) State and proof the Castiglino theorem?

d) State the yield criterion as given by Tresca and Von-Mises and represent these criteria in two dimensional stress space.

e) A steel shaft (σ_0 =750MPa) is subjected to a static load consists of bending moment 20KNm and torsional moment of 60KNm.Use factor of safety of 1.5.Determine the shaft diameter based on (i) Tresca stress theory (ii) Von-Mises theory. Assume data if any.

f) At a point in a body the stress tensor is given by :

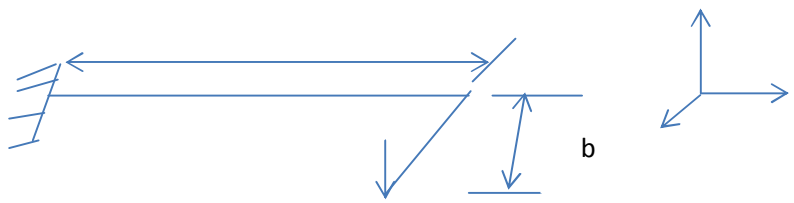
$$\sigma_{ij} = \begin{pmatrix} 80 & 25 & -40 \\ 25 & -40 & 35 \\ -40 & 35 & 60 \end{pmatrix} \text{MPa}$$

(i) Determine the principal stresses and maximum shear stress.
(ii) Hydrostatic and deviator stress.

g) A cantilever beam of 2000mm span having rectangular cross section of depth 80mm is subjected to a transverse load at its free end that fluctuates between 800N download to 2KN upword. Determine width of beam. Take σ_{yp}=300MPa f_e=250MPA FS=2.25

h) State and explain the Maxwell's reciprocal theorem.

i)



The bend wire is loaded as shown in the figure, determine the translation and rotation of the end A about x,y and z axes using energy method.

j) Derive the stress strain relation for a classical laminate and represent the stress strain variation ina laminate?

k) Briefly explain the inter laminar stresses in alaminated composite?

l) Derive the Winkler Bach formula for a curved beam.

Part-III

Long Answer Type Questions (Answer Any Two out of Four)

Q3 $\sigma_x = C[y^2+v(x^2-y^2]$, $\sigma_y = C[x^2+v(y^2-x^2]$, $\sigma_z = C[v(x^2+y^2]$, $\tau_{xy} = -2\,C\,vxy$, $\tau_{yz} = \tau_{zx} = 0$ **(16)**

Body forces are 0, C is a constant and v is poission's ratio. State

a) Are the equation of equilibrium is satisfied.
b) Are the compatibility equations are satisfied.
c) Is it a feasible solution.

Q4 A crane hook has a symmetrical trapezoidal section 56mm deep, the inner and outer widths being 50mm and 25mm respectively. Estimate the extreame intensities of stress when hook carries a load of 12.5KN, the load line passing 50mm from the inside edge of the section and the center of curvature being in the load line. **(16)**

Q5 The internal and external diameters of a thick cylinder are 400mm and 600mm respectively. It is subjected to an external pressure of 5N/mm^2. Find the internal pressure that can be applied if the maximum permissible stress is limited to 14.5 N/mm^2 . Sketch the variation of Hoop stress and radial stress across the cylinder. What will be the change in thickness of the cylinder if E =2.1x10^5 N/mm^2 N/mm^2 and Poisson's ratio=0.3. **(16)**

Q6 Compute and show the shear flow on the thiion in Fig., if the vertical load is 5660N, locate the position of the shear center. **(16)**