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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: : PUTTUR**  
(AUTONOMOUS)**B.Tech. II Year II Semester Regular & Supplementary Examinations May 2019**  
**STRENGTH OF MATERIALS -II**

(Civil Engineering)

Time: 3 hours

Max.Marks:60

(Answer all Five Units 5 X 12 = 60 Marks)

**UNIT-I**

- 1 a What is plane stress condition? Explain briefly. 4M  
 b A rectangular element in a strained material is subjected to tensile stresses of  $120\text{N/mm}^2$  and  $60\text{N/mm}^2$  on two mutually perpendicular planes together with a shear stress of  $70\text{N/mm}^2$ . Find the principal stresses, principal planes and maximum shear stress in the block? Also find the plane of maximum shear stress? 8M

**OR**

- 2 List out the different theories of failure. Explain any three theories of failure. 12M

**UNIT-II**

- 3 A compound cylinder is composed of a tube of 250 mm internal diameter at 25mm wall thickness. It is shrunk on to a tube of 200mm internal diameter. The radial pressure at the junction is  $8\text{N/mm}^2$ . Find the variation of hoop stress across the thickness of wall of the compound cylinder, if it is under an internal fluid pressure of  $60\text{N/mm}^2$ ? 12M

**OR**

- 4 a Calculate the increase in volume of a boiler, 3m long and 1m diameter when subjected to an internal pressure of  $200\text{N/cm}^2$ ? The wall thickness is such that the maximum tensile stress does not exceed 30Mpa. Take  $E = 2.1 \times 10^4 \text{N/mm}^2$  and  $\frac{1}{m} = 0.30$ . 6M  
 b Derive an expression for circumferential stress induced in a thin spherical shell subjected to an internal fluid pressure of 'p'. 6M

**UNIT-III**

- 5 a Derive the equation for resultant stress when a column of rectangular section is subjected to a load which is eccentric to both the axes. 6M  
 b Define kernel of a section and derive the Kernel for a solid circular section. 6M

**OR**

- 6 a Explain the concept of springs in series and springs in parallel. 6M  
 b A leaf spring carries a central load of 3000N. The leaf spring is to be made of 10 steel plates of 50mm width and 6mm thick. If the bending stress is limited to  $150\text{N/mm}^2$ , determine the length of the spring and deflection at centre of the spring? Take  $E = 2 \times 10^5 \text{N/mm}^2$ . 6M

**UNIT-IV**

- 7 a Explain the limitation of Euler's formula. 4M  
 b Derive the equation for the Euler's crippling load for a column when both ends are fixed. 8M

**OR**

- 8 A built up column consisting of rolled steel beam ISWB 300 with two plates 200mm x 10mm connected at the top and bottom flanges. Calculate the safe load the column can carry, if the length is 3m and both ends are fixed? Take factor of safety =3,  $f_c = 320 \text{N/mm}^2$  and  $\alpha = \frac{1}{7500}$ . 12M

**UNIT-V**

- 9 a What is un-symmetrical bending? 2M  
b Determine the principal moments of inertia for an unequal angle section 125 mm X 75mm x 10mm? 10M

**OR**

- 10 A curved beam is in the form of full continuous circle in plane with a radius of 4m and is supported continuously on six supports. The beam carrying an u.d.l of 2KN/m inclusive of its own weight. Determine the bending moment and twisting moment at salient locations? The coefficients  $C_1$ ,  $C_2$  and  $C_3$  are 0.089, 0.045 and 0.009 respectively. Draw the bending moment and twisting moment diagrams. 12M