Hall Ticket No: | | | | | | | | | | | **Question Paper Code :**

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(AUTONOMOUS)

M.E/M.Tech I-Semester Regular Examinations, November 2015

ADVANCED MECHANICS OF SOLIDS

(MACHINE DESIGN)

Date: **Time: 3 hours** **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

Unit-1

1. Derive from first principles, the formulae used for solving the following problem. A circular plate is made of steel has a radius a = 250 mm, and has thicknessh = 25 mm. The plate is simply supported and subjected to a Uniform pressure p= 1.38 MPa. Determine the maximum bending stress in the plate and maximum deflection and determine the pressure required to initiate yielding in theplate and the factor of safety against initiation of yielding in theplate. Take E = 200 GPa, ϑ= 0.29,and Y = 276 MPa.

OR

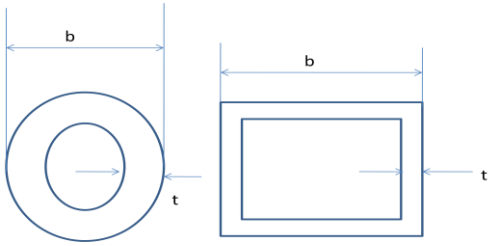
2. Derive the maximum displacement for a simply supported circular plate of radius 'a' with circular hole of radius 'b' at the center and subjected to uniform lateral pressure $p=p_0$ from the fundamentals.

Unit-2

3. Derive the general equation of twist and shear stress induced in the shafts of equilateral triangle Cross Section subjected to pure torsion

OR

4. a.) What is saint venant's semi inverse method? Explain.
   b.) the hollow circular and square thin wall torsion member in fig. have identical values 'b' and 't', determine the ratio of torque and unit angle of twist for the two torsion member for equal shearing in each .



Unit-3

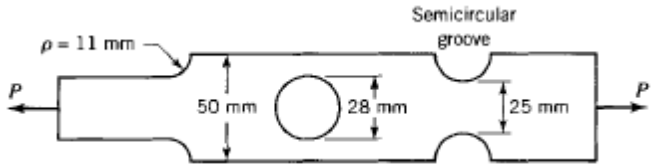
5. Consider a beam of semi-infinite beam on an elastic foundation subjected to a point load nearby the one end. Determine the displacement, slope, moment, and shear of the beam.

OR

6. A very long wooden beam whose cross section is 100 nm x 200mm rest on an earth foundation. Foundation modulus of earth is 4.5 MN/m^2 and E =10.5 GN/m^2 . A uniform distributed load of 400 N/m extended over the length of 3m of the beam near the middle section. Compute the the maximum deflection and maximum flexural stress in the beam.

Unit-4

7. A rectangular bar of mild steel has a yield point of Y =276 MPa and a thickness of 7.0 mm. The bar is subjected to a tensile load P.
   a. Determine the value of P that will first cause yielding atsome point in the bar.
   b. Determine the value of P that will first cause a section of thebar to become fully plastic.



OR

8. a.) Explain the influence of stress gradients on the propagation of crack.
   b.) Define stress concentration and explain the phenomenon with two examples.

Unit-5

9. A fatigue testing machine has two identical steel disks E = 200 GPa and v = 0.29 rolling together. The identical disks have a radius of curvature of 40 mm and width h = 20 mm. For rolling without friction, a load P = 24.1 kN produces the following stresses σ_{max} = 1445 Mpa, τ_{max} = 433 MPa and $\tau_{oct\,(max)}$= 361 MPa. Let the cylinders be subjected to a load P = 24.1 kN and be rotated at slightly different speeds so that the roller surfaces slide across each other. If the coefficient of sliding friction is 0.11 1.
   a. Determine σ_{max} (tension) and σ_{max} (compression)
   b. Also find the τ_{max} and $\tau_{oct\,(max)}$

OR

10. Let the two semicircular disks be made of steel $E_1 = E_2 = 200$ Gpa and $\mu_{1=}\mu_{2=}0.29$ .The radii of curvature of the two surfaces at the point of contact are R_1 = 60 mm, R_2 = 80 mm, $R_1' = 130mm$ and $R_2' = 200mm$ .The angle α between the planes of minimum curvature is $\frac{\pi}{3}$rad. If the load P = 4.50 kN,
    a. Determine the maximum principal stress, maximum shear stress, and maximum octahedral shear stress in the disks and state the location of the point where each of these stresses occurs.
    b. Determine the approach δ for the two disks because of load P