G.PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY
ASSIGNMENT QUESTIONS FOR UNIT I ,II ,III,IV & V
SUB: STRENGTH OF MATERIALS –II
II.B.Tech II-SEM, CIVIL

UNIT I

ESSAY QUESTIONS

1.At a point in a straight material the principal tensile stresses across two perpendicular planes , are 80N/mm^2 and 40 N/mm^2 .Determine normal stress, shear stress and the resultant stress on a plane inclined at 20^0 with the major principal plane . Determine also the obliquity. What will be the intensity of stress, which acting alone will produce the same maximum strain if Poisson's ratio=1/4.

2. Derive an expression for the subject to principal stresses σ_1 distortion energy per unit volume when a body is subjected to $\sigma_{1,}$ σ_2 and$_,$ σ_3.

The principal stresses at a point in an elastic material are 100 N/mm (tensile) ,80 N/mm^2 (tensile)and 50 N/mm^2 (compressive).If the stress at the elastic limit in simple tension is 200 N/mm^{2,} determine whether the failure of material will occur according to maximum principal stress theory . If not, then determine the factor of safety.

3. Find an expression for the change in volume of a thin cylindrical shell subjected to internal fluid pressure.

4. A compound cylinder is made by shrinking a cylinder of external diameter 300mm and internal diameter of 250mm over another cylinder of external diameter 250mm and internal diameter of 200mm.The radial pressure at the junction after shrinking is 8N/mm^2 .Find the final stresses set up across the section, when the compound cylinder is subjected to an internal fluid pressure of 84.5N/mm^2.

5.At a point in a straight material the principal tensile stresses across two perpendicular planes , are 80N/mm^2 and 40 N/mm^2 .Determine normal stress, shear stress and the resultant stress on a plane inclined at 20^0 with the major principal plane . Determine also the obliquity. What will be the intensity of stress, which acting alone will produce the same maximum strain if Poisson's ratio=1/4.

6.Derive an expression for the subject to principal stresses σ_1 distortion energy per unit volume when a body is subjected to $\sigma_{1,}$ σ_2 and$_,$ σ_3.

7.The principal stresses at a point in an elastic material are 100 N/mm^2(tensile) ,80 N/mm^2 (tensile)and 50 N/mm^2 (compressive).If the stress at the elastic limit in simple tension is 200 N/mm^{2,} determine whether the failure of material will occur according to maximum principal stress theory . If not, then determine the factor of safety.

8.The stresses at a point in a bar are 200N/mm2 (tensile) and 100 N/mm2 (compressive) . Determine the resultant stress in magnitude and direction on a plane inclined at 600 to the axis of the major stress .Also determine the maximum intensity of shear stress in the material at the point.

9.Derive an expression for strain energy theory.

10. A rectangular block of material is subjected to a tensile stress of 110 N/mm^2 on one plane and a tensile of 47 N/mm^2 on the plane at right angles to the former. Each of the stress is accompanied by a shear stress of 63N/mm^2 and that associated with the former tensile stress tends to rotate the block anticlockwise. Find (i)the direction and magnitude of each of the principal stress and
(ii)magnitude of the greatest shear stress.

11.According to the theory of maximum shear stress, determine the diameter of a bolt which is subjected to an axial pull of 9 KN together with a transverse shear force of 4.5 KN.Elastic limit in tension is 225 N/mm^2 ,factor of safety =3 and Poisson's ratio = 0.3.

12.The stresses at a point in a bar are 200N/mm^2 (tensile) and 100 N/mm^2 (compressive) . Determine the resultant stress in magnitude and direction on a plane inclined at 60^0 to the axis of the major stress Also determine the maximum intensity of shear stress in the material at the point.

13. Derive an expression for strain energy theory .

14.At a point in a straight material the principal tensile stresses across two perpendicular planes , are $80N/mm^2$ and 40 N/mm^2 .Determine normal stress, shear stress and the resultant stress on a plane inclined at 20^0 with the major principal plane . Determine also the obliquity. What will be the intensity of stress, which acting alone will produce the same maximum strain if Poisson's ratio=1/4.
15.At a point in strained material the principal stresses are 100 N/mm2 (tensile) & 60 N/mm2(Compressive).Determine the normal stress ,Shear stress & Resultant Stress on a plane inclined at 500 to the axis of major principle stresses .Also determine the maximum shear stress at the point.

SHORT QUESTIONS

1. Define the terms: Principal planes and principal stresses
2. A rectangular bar is subjected to a direct stress (σ) in one plane only. Prove that the normal stress on an oblique plane is given by σn=σ cos2 ɵ
3.What do you understand by the term "Theories of failure "? Name the important theories of failure.
4.Define and explain the maximum principal strain theory.
5.A rectangular bar is subjected to a direct stress (σ) in one plane only. Prove that the shear stress on an oblique plane is given by σt= (σ/2) sin2ɵ.
6.Define and explain the maximum principal stress theory.
7.Write a note on Mohr's circle of stresses.
8.Define and explain the maximum shear stress theory
9.Define the term obliquity and how it is determined
10.A rectangular bar is subjected to a direct stress (σ) in one plane only. Prove that the normal stress on an oblique plane is given by σn=σ cos2 ɵ
11.Define and explain the maximum strain energy theory.
12. What do you understand by the term "Theories of failure "? Name the important theories of failure.

UNIT II

ESSAY QUESTIONS

1. Find an expression for the change in volume of a thin cylindrical shell subjected to internal fluid pressure.
2. A compound cylinder is made by shrinking a cylinder of external diameter 300mm and internal diameter of 250mm over another cylinder of external diameter 250mm and internal diameter of 200mm.The radial pressure at the junction after shrinking is $8N/mm^2$ .Find the final stresses set up across the section, when the compound cylinder is subjected to an internal fluid pressure of $84.5N/mm^2$.
3. Derive an expression for volumetric change in the thin spherical shells.
4. Derive an expression for the radial pressure and hoop stress for a thick spherical shell**.**
5.Define thin cylinders .Name the stresses set up in a thin cylinder subjected to internal fluid pressure.
6.What do you mean by Lames equation .Explain each term in the equation?
7. A copper cylinder, 90cm long,40cm external diameter and wall thickness 6mm has its both ends closed by rigid blank flanges. It is initially full of oil at atmospheric pressure. Calculate the additional volume of oil which must be pumped in to it in order to raise the oil pressure to $5N/mm^2$ above atmospheric pressure. For copper assume $E=1.0X10^5$ N/mm^2 and Poisson's ratio=1/3.Take bulk modulus of oil as $2.6X10^3N/mm^2$.
8. A thick spherical shell of 200mm internal diameter is subjected to an internal fluid pressure of 7 N/mm^2 . If the permissible tensile stress in the shell material is 8 N/mm^2 find the thickness of the shell.
9.A compound cylinder is made by shrinking a cylinder of external diameter 300mm and internal diameter of 250mm over another cylinder of external diameter 250mm and internal diameter of 200mm.The radial pressure at the junction after shrinking is $8N/mm^2$ .Find the final stresses set up across the section, when the compound cylinder is subjected to an internal fluid pressure of $84.5N/mm^2$.

10. A cylindrical tube 80mm internal diameter & 5 mm thick is closed at the ends & is subjected to an internal pressure of 6 N/mm2.A torque of 2009600Nmm is also applied to the tube. Find the hoop stress, longitudinal stress, maximum & minimum principle stresses & the maximum shear stresses .
11. Prove that the original difference in radii at the junction of a compound cylinder for shrinkage is given by dr= (2r*/E)(a1-a2)
12. Derive an expression for the radial pressure and hoop stress for a thick spherical shell.
13.A copper cylinder, 90cm long,40cm external diameter and wall thickness 6mm has its both ends closed by rigid blank flanges. It is initially full of oil at atmospheric pressure. Calculate the additional volume of oil which must be pumped in to it in order to raise the oil pressure to 5N/mm2 above atmospheric pressure. For copper assume E=1.0X105 N/mm2 and Poisson's ratio=1/3.Take bulk modulus of oil as 2.6X103N/mm2.
14.A thick spherical shell of 200mm internal diameter is subjected to an internal fluid pressure of 7 N/mm2 . If the permissible tensile stress in the shell material is 8 N/mm2 find the thickness of the shell.
15.Derive an expression for volumetric change in the thin spherical shells.

SHORT QUESTIONS

1.Show that in thin cylinder shells subjected to internal fluid pressure, the circumferential stress is twice the longitudinal stress.
2. Derive the expressions for hoop stress in thin cylinders
3.What do you mean by Lames equation .Explain each term in the equation?
4.Derive the expressions for longitudinal stress in thin cylinders
5.Define thin cylinders .Name the stresses set up in a thin cylinder subjected to internal fluid pressure.
6. Show that in thin cylinder shells subjected to internal fluid pressure, the circumferential stress is twice the longitudinal stress.
7.Derive the expressions for hoop stress in thin cylinders
8.What do you mean by Lames equation .Explain each term in the equation?
9.Define thin cylinders .Name the stresses set up in a thin cylinder subjected to internal fluid pressure.

UNIT III

ESSAY QUESTIONS

1. Derive an expression for the maximum stress developed in the laminated spring.
2. Prove that the torque transmitted by a solid shaft when subjected to torsion is given by T=(π/16)*τD3.
3. Derive an expression for the maximum stress developed in the laminated spring.
4. Derive an expression for the deflection of a closed coiled helical spring at the center due to axial load W.
5. A solid circular shaft and a hollow circular shaft whose inside diameter is (3/4) of the outside diameter are of the same material, of equal lengths and are required to transmit a given torque. Compare the weights of these two shafts if the maximum shear stress developed in the two shafts is equal.
6. Two shafts of the same material and of same lengths are subjected to the same torque,if the first shaft is of a solid circular section and the second shaft is of hollow circular section,whose internal diameter is 2/3 of the outside diameter and maximum shear stress developed in each shaft is the same compare the weights of the shafts.
7. A shaft ABC of 500mm length and 40mm external diameter is bored, for a part of its length AB to a 20mm diameter and for the remaining length BC to a 30mm diameter bore. If the shear stress is not to exceed 80N/mm2, find the maximum power the shaft can transmit at a speed of 200r.p.m.If the angle of twist in the length of 20mm diameter bore, find the length of the shaft that has been bored to 20mm and 30mm diameter.
8.Derive the expression for the strain energy stored in abody due to torsion.
9. Derive the expression for the torsion of tapering shafts.

SHORT QUESTIONS

1.What do you mean by strength of a shaft?s
2. Define the terms: Torsion, Torsional Rigidity and Polar moment of inertia.
3.What is basic torsional equation?
4.Give the expression for the max. torque transmitted by the shaft.
5.Define polar moment of inertia and polar modulus.
6.Write the formula for the torque of tapering section of the shaft.
7.Define the assumptions of theory of torsion.
8.Write the basic torsional equation.

UNIT IV & V

ESSAY QUESTIONS

1. Give the expression for the Crippling load by Euler's formula for a column having both ends fixed.
29. A column of circular section is subjected to a load of 120 KN.The load is parallel to the axis but eccentric by an amount of 2.5mm.The external & internal diameters are 60mm & 50 mm respectively. If both the ends of the column are hinged and Column is 2.1m long. Then determine the maximum stress in the column. Take E=200 GN/m2.
2. Give the expression for the Crippling load by Euler's formula for a column having one end fixed and other end free.
3.A hollow cylindrical cast iron column is 4m long with both ends fixed.Determine the minimum diameter of the column if it has to carry a safe load of 250KN with a factor of safety of 5.Take the internal diameter as 0.8 times the external diameter.Take σc=550N/mm2 & a=1/1600 in Rankine's formula.
4. Give the expression for the Crippling load by Euler's formula for a column having one end fixed and other end hinged.
5. Give the expression for the Crippling load by Euler's formula for a column having both ends fixed .
6.Find an expression for the change in volume of a thin cylindrical shell subjected to internal fluid pressure.

SHORT QUESTIONS

1. Define the terms: column, strut and crippling load.
2. What do you mean by end conditions of a column? How is the concept used in the following theory?
3. What do you mean by end conditions of a column? How is the concept used in the following theory?
4. Define slenderness ratio. State the limitations of Euler's formula.
5. Explain how the failure of a short and of a long column takes place.
6. Define slenderness ratio. State the limitations of Euler's formula.
7.Explain the assumptions made in Euler's column theory.
8. Explain how the failure of a short and of a long column takes place.