****Last Date of Submission ……..** **Section CE 21/22**

Babu Banarasi Das -National Institute of Technology & Management, Lucknow

B. Tech Second Year (Third Semester) 2018-19

Department of Civil Engineering

Mechanics Of Solid (RME-303)
Assignment: I (Unit 1)

NOTE-ATTEMPT ALL PARTS

1. Briefly explain about types of stresses?
2. A bar of length 20 cm tapers uniformly from 40 mm dia. to 35mm dia. calculate the change in its length due to an axial pull of 100kN, if E = 200GPa. Derive the formula used in the calculations.
3. A steel rod 100 mm2 in cross section stretches by 0.4 mm over a gaugelength of 50 mm under an axial load of 30 k N. What is the strain – energy stored in it? If the load at the elastic-limit is 45 k N, find the elongation at elastic – limit and the proof resilience?
4. An I – section beam 350mm × 250mm has a web thickness of 12mm and flange thickness of 20mm. It carries a shear force of 120KN. Sketch the shear stress distribution across the section.
5. Define section modulus. Obtain section modulus for rectangular and circular sections. Write the expression for stresses in terms of section modulus and B.M.
6. Draw S.F.D & B.M.D for a cantilever carrying a load whose intensity varies uniformly from zero at the fixed end to W per unit run at the free end.
7. A steel plate is bent into a circular arc of radius 10 meters. If the plate section be 120mm wide and 20 mm thick , find the maximum stress induced and the bending moment which can produce this stress. Take E = 2×10^5Mpa
8. Explain about Elasticity.
9. Define:

   i) Bending Moment.

   ii) Shear force.

   iii) Point of contra flexure

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10. Define Resilience.

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Mechanics of Solid (RME-303)
Assignment: II (Unit 2)

NOTE-ATTEMPT ALL PARTS

1. What is moment area method? Explain the two Mohr's theorems, as applicable to the slope and deflection of a beam.
2. Write the formula of slope for cantilever beam subjected to UDL?
3. A cantilever of uniform cross-section of length l carries two point loads, W at the free end and 2W at a distance a from the free end. Find the maximum deflection due to this loading.
4. A simply supported beam of span 3 m is subjected to a central load of 10 kN. Find the maximum slope and deflection of the beam. Take I = 12 *$(10)^6$ mm^4 and E = 200 GPa.
5. Define Factor Of safety
6. A cantilever of length 2.8 m fails when a load of 4.7 kN is applied at the free end. If the section of the beam is 65 × 105 mm find the stress at failure.
7. Write any three theory of failures.
8. Write Maximum Strain Energy theory.
9. The external and internal diameters of an aluminum tube are 30 mm and 25 mm respectively. The yield stress for aluminum is σy= 270 N/mm^2 Determine the maximum axial load that can be carried by the tube.
10. Find the slope at both ends of simply supported beam having UDL over whole span using area moment method.

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Mechanics of Solid (NME-302)
Assignment: III (Unit 3)

NOTE-ATTEMPT ALL PARTS

1. Find the expression of critical load of a long column having both end fixed.
2. Explain about Rankine's theory.
3. Write the difference between Euler's theory and Rankine's theory.
4. Find the expression of critical load for a long column having one end fixed and other is free.
5. Determine the buckling strength of two columns of circular cross- section one hollow and other is solid when both are made of same material , same cross-section and are of same end conditions. The internal diameter of the hollow column is half of the external diameter.
6. Find the expression of maximum shear stress and maximum strain energy and deflection of a close coil helical spring.
7. Find the maximum stress for a steel short column using Rankine theory.
8. Find the expression of a critical load for a long a column having both ends hinged.
9. Find the expression of a critical load for a long a column having one end hinged and one end fixed.
10. Derive the expression of strain energy for the open coil spring .

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B. Tech Second Year (Third Semester) 2018-19

Department of Civil Engineering

Assignment: IV (Unit 4)
Mechanics of solid(RME-303)

NOTE=ATTEMPT ALL PARTS

1. Explain why `wire wound their cylinders' are more efficient than `ordinary thin cylinders'.

2. A seamless pipe of 1m diameter is carrying a fluid under a pressure of10 N/mm2. Calculate the necessary thickness of the pipe, if

the maximum allowable stress in the pipe material is 100N/mm2.

3. A thin cylinder of 300mm internal diameter, 3 m long and made from 3mm thick metal, has its ends blanked off. Working fromfirst principles, except that you may use the equations derived above, find the change in capacity of this cylinder when an internal fluid pressure of 20 bar is applied. E =200GN/m^2.v = 0.3
4. Derive the expression for thick cylinder using lame's theory
5. Derive the equations for the circumferential and longitudinal stresses in a thin cylindrical shell.
6. A compound tube is composed of a tube 250 mm internal diameter and 25mm thick shrunk on a tube of 250 mm external diameter and 25 mm thick.The radial pressure at the junction is 8 N/mm^2. The compound tube is subjected to an internal fluid pressure of 84.5 N/mm^2.Find the variation of the hoop stress over the wall of the compound tube.
7. A thick spherical shell of 100 mm internal diameter is subjected to an internal fluid pressure of 30 N/mm^2. If the permissible tensile stress is 80 N/mm^2, find the thickness of the shell.
8. Write the difference b/w thick and thin cylinder.
9. What do you mean by longitudinal stress,hoop stress and radial stress.Show the variation of stresses for all cases.
10. A steel cylinder 240mm internal diameter is to withstand an internal pressure of 5N/mm^2. The increase in area of the bore due to the resulting radial expansion is limited to 0.1% of the nominal area. Calculate the necessary thickness of the cylinder and the circumferential stress induced in the section.Take E = 2X10N/mm^2 $\mu = 0.3$.

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Mechanics of Solid(RME-303)
Assignment: V (Unit 5)

NOTE-ATTEMPT ALL PARTS

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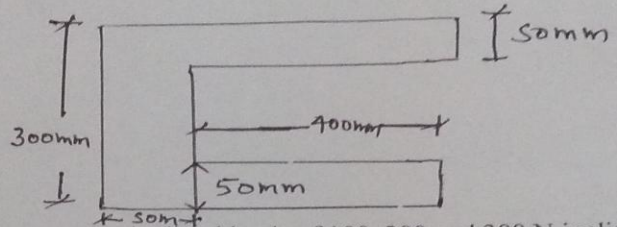
B. Tech Second Year (Third Semester) 2018-19
Department of Civil Engineering

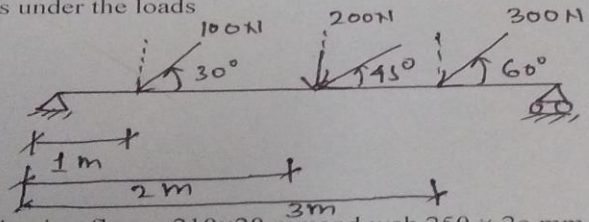
Mechanics of Solid(RME-303)
Assignment: V (Unit 5)

NOTE-ATTEMPT ALL PARTS

1. Define shear centre and the principle involved in locating the shear centre.
2. Locate the shear centre of the section shown in Figure 3.



3. A simply supported beam carries inclined loads of 100, 200 and 300 N inclined at 30^0 and 45^0 and 60^0 to the vertical as shown in Figure 2. The loads act at 1 metre, 2 metres and 3 metres from the left support respectively. If the span is 4 meters, draw the bending moment and shear force diagram and calculate their values under the loads



4. A T-beam having flange 210×20 mmand web 250 × 2o mm is simply supported over a span of 5 m. It carries a u.d.l of 8.8kN/m^2 over its entire span. Calculate the maximum compressive and tensile stress occurring inthe section. What is the magnitude of flexural stress at the junction of flange and web? Draw the variation of stress across the section.

5. What do you mean by Unsymmetrical bending.
6. Find the expression of h^2 for trapezoidal section.
7. What is shear center?Prove that shear center for a thin walled balance Z-section coincides with its centroid.
8. Derive the equation to find the position of neutral axis for the section of curved rectangular section.
9. Derive the expression of shear center for L-Section.
10. Derive the expression of H^2 for rectangular section.

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