QPC: RJ20MTECH073 AR 19 Reg. No

GIET UNIVERSITY, GUNUPUR – 765022

M. Tech (First Semester – Regular) Examinations, June – 2021

MPEMD 1044 – ADVANCED MECHANICS OF SOLIDS

(Machine Design)

Time: 2 hrs Maximum: 50 Marks

The figures in the right hand margin indicate marks.

PART – A **(2 x 10 = 20 Marks)**

Q1. Answer **ALL** questions

a. State the reasons for unsymmetrical bending.

b. Distinguish between state of plane stress and state of plane strain?

c. State the Euler's critical load in a case where Column with one end fixed and the other end free. Define the normal and shear stress components.

d. What is resilience?

e. What do you mean by lame's theory of thick cylinder? State the assumptions for lame's theory.

f. State the position of maximum and minimum circumferential and radial stresses in a solid rotating disc.

g. What do you mean by membrane analogy for thin walled tube?

h. State the limitations of the membrane theory of shell for strength analysis of pressure vessels.

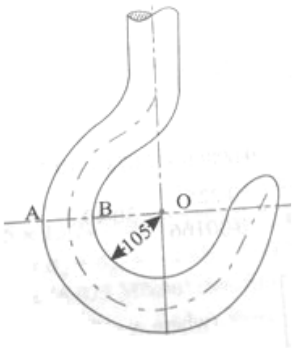
i. Explain St. Venant's principle?

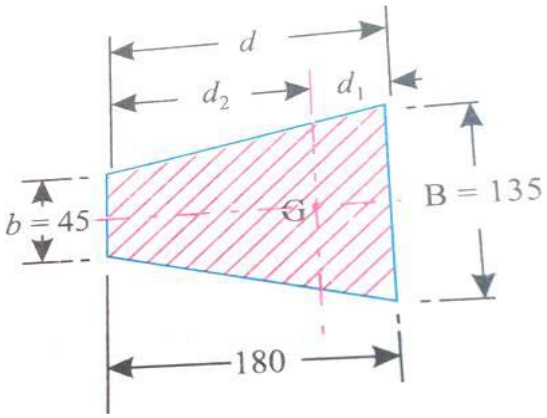
j. Define Harmonic Excitation of a system?

PART – B **(6 x 5 = 30 Marks)**

Answer ***ANY FIVE*** questions **Marks**

2. Fig shows a crane hook lifting a load of 150KN.Determine the maximum compressive and tensile stresses in the critical section of the crane hook.





(6)

3. Stress tensor at a point is given by

$$\sigma_{ij} = \begin{bmatrix} 1 & 2 & 1 \\ 2 & -2 & -3 \\ 1 & -3 & 4 \end{bmatrix}$$ (6)

all in units of kPa. Find the principal stresses and check for invariance.

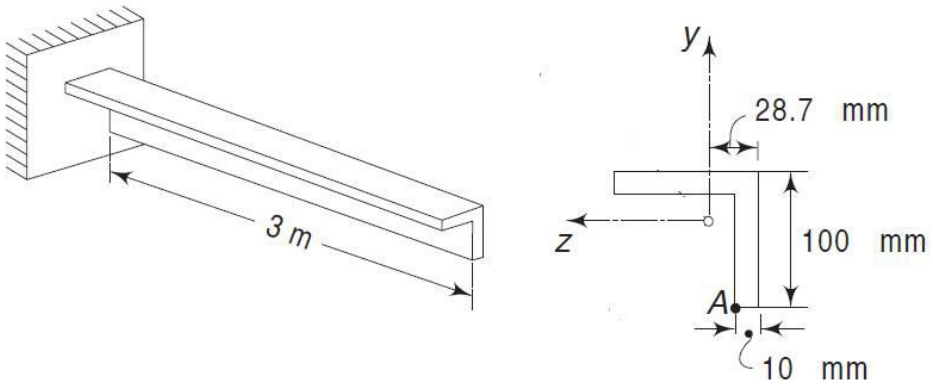
4. Derive an equation of circumferential stress for thick cylinder subjected to internal pressure P1 and external pressure P2? (6)

5. A shaft of hollow square section of outer side 60 mm and inner side 45 mm is subjected to twisting such that the maximum shear stress developed is 350 N/mm2.What is the torque acting on the shaft and angular twist if the shaft is 1.2m long? Take G = 8.1 x 10^5 N/mm^2. (6)

6. Derive the differential equation of equilibrium for 3D state of stress on a body in rectangular co-ordinate system. (6)

7. Deduce from the first principle the equation for deflection of a plate under the combined effect of bending and tension assuming that the body forces are present in both the directions. (6)

8. A beam of equal-leg angle section, shown in figure below, is subjected to its own weight. Determine the stress at point A near the built-in section. It is given that the beam weighs 1.48N/cm. Given: I_{zz}=180$cm_4$$I_{zy}$=106.57$cm^4$



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