MR15

Code No.: 50305

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)
Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad

II B.TECH II SEMESTER SUPPLEMENTARY EXAMINATIONS, DECEMBER-2019

Subject: **MECHANICS OF SOLIDS**

Branch: **MINING**

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

PART – A

5x2M=10 M

Answer ALL questions of the following

1. Define longitudinal strain and lateral strain.
2. Define point of contra flexure. In which beam it occurs?
3. What is the ratio of maximum shear stress to the average shear stress for the rectangular section?
4. Write the assumptions made during the derivation of torsion in shaft.
5. What are the ways a thin cylindrical shell may fail?

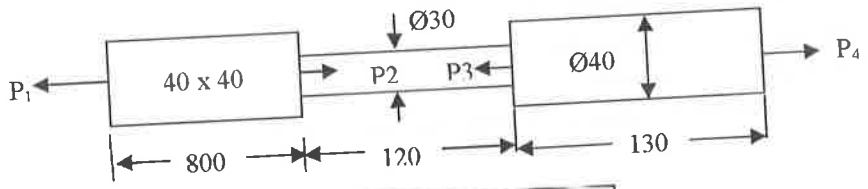
PART-B

5x10 M= 50M

Answer any FIVE questions of the following

1. A bar of 30 mm diameter is subjected to a pull of 60 kN. The measured extension on gauge length of 200 mm is 0.09 mm and the change in diameter is 0.0039 mm. calculate the Poisson's ratio and the values of the three moduli.

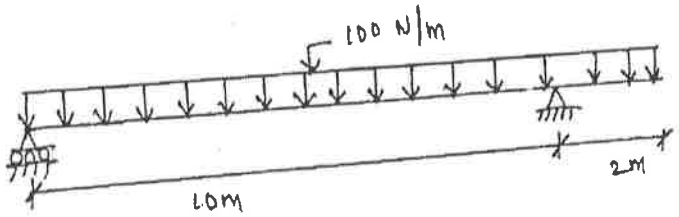
2. a) Determine the diameter of the steel rod to carry a load of 10 kN, if the deformation not to exceed 0.03%. Take E= $2x10^5$ N/mm^2. (4 M)
   b) A steel bar subjected to a point loads P_1=120 kN, P_2= 220 kN, P_4=160 kN and P_3 as shown in the figure.



All Dimensions are in mm

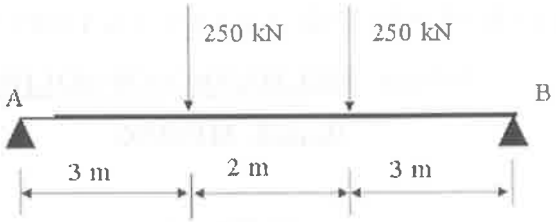
Determine the magnitude of the force P_3 necessary for the equilibrium and also determine the net change in length of the steel bar, Take E=200 GPa. (6 M)

3. Draw the shear force and bending moment diagrams for the beam shown in Fig. Also determine the maximum bending moment and location of point of contra flexure.



4. Derive bending equation M/I=f/y=E/R with assumptions made.

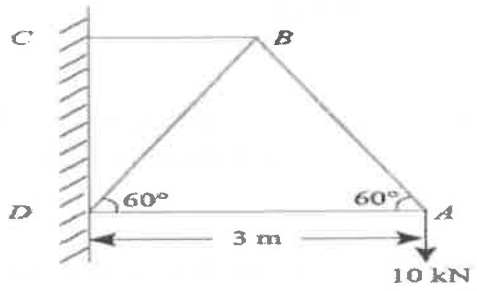
5. Calculate the maximum deflection of the beam shown in figure 7 by Macaulay's method. Take E=200 GPa, I=301x10^6 mm^4.



6. a) Obtain a relation for the torque and power, a solid shaft can transmit.

   b) A solid steel shaft has to transmit 100 kW at 160 r.p.m., taking allowable shear stress as 70 MPa, find the suitable diameter of the shaft. The maximum torque transmitted in each revolution exceeds the mean by 20%.

7. A cantilever truss of 3 m span is loaded as shown in the figure. Solve the forces in the various members of the framed truss, and tabulate the results.



8. A cylindrical shell 800 mm in diameter, 3 m long is having 10 mm metal thickness. If the shell is subjected to an internal pressure of 2.5 N/mm^2, determine:
   a. the change in diameter
   b. the change in length and
   c. the change in volume.

   Assume the modulus of elasticity and Poisson's ratio of the material of the shell as 200 N/mm^2 and 0.25 respectively.