# MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)
Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad.

III B.Tech II Semester Supplementary Examinations, NOVEMBER-2017
SUBJECT: Finite Element Methods
Branch: ME

Time: 3 hours   **Max. Marks: 75 Mark**

Answer Any 5 Questions   **5x15 Marks= 75 Marks**

1. a) Explain different methods of applying boundary conditions.   [10]
   b) List out the advantages and disadvantages of FEM.   [5]

2. Derive element stiffness matrix for one dimensional bar element from the fundamental principles.   [15]

3. Derive the stiffness matrix for 2-D plane truss element.

4. For the beam shown in figure determine the reactions and displacements.
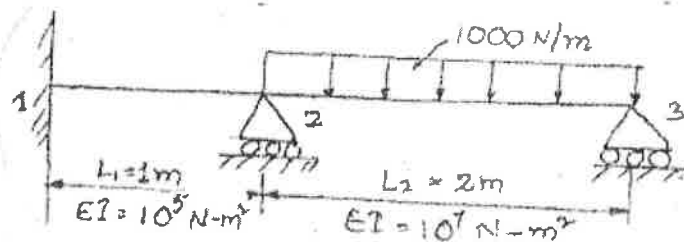

5. a) Distinguish between CST and LST   [4]
   b) Solve the problem shown in below using CST element.   [11]
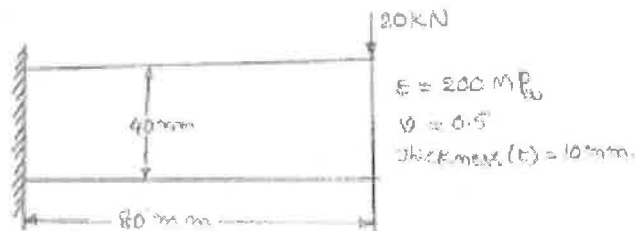
6. Find the strain Displacement matrix for axisymmetric triangular element shown in figure. Also find the element strains. The nodal displacements are (All dimensions are in cm)

   u1 =0.002   w1=0.001   u2= 0.001   w2 = -0.004   u3 = -0.003   w3 =0.007
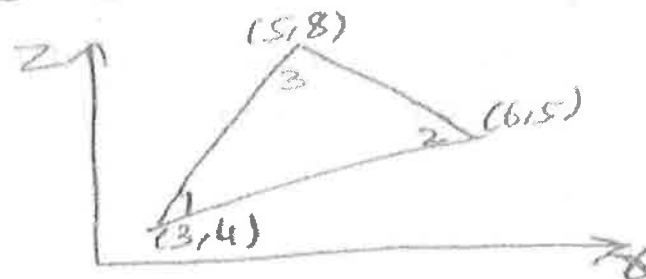
7. A metallic fin with thermal conductivity K=360 w/m°C, 0.1cm thick and 10cm long extends from a plane wall whose temperature is 325°C. Determine the temperature distribution and amount of heat transferred from the fin to the air at 20°C with h=9W/m² °C. Take width of fin is 1m. Assume that tip of the fin is insulated.

8. Calculate the natural frequency displacement of a stepped bar as shown in figure.
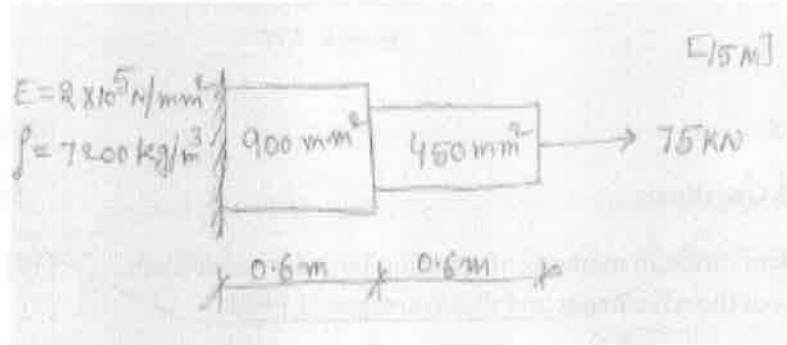
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III B.Tech II Semester Supplementary Examinations, NOVEMBER-2017

SUBJECT: **Design of Machine Members - II**

Branch: ME

Time: 3 hours   Max. Marks: 75 Mark
Answer Any 5 Questions   **5x15 Marks= 75 Marks**

1) Design a journal bearing for a steam turbine, whose shaft is supported on two bearings one at each side of the turbine, and is coupled with a generator for power production. The weight of the turbine with shaft is measured as 40 KN and the shaft rotates at 1500 rpm. Diameter of the shaft is 100 mm.   (15M)

2) The radial reaction on a bearing is 9000 N. It also carries a thrust load of 5000 N. The speed of the shaft is 1000 rpm. The outer ring is stationary. Expected average life of bearing is about 25000 hours. The load on the bearing is smooth, the service is 8 hours/day.
   a) Select a suitable roller bearing   b) What is the rated 90 % life of selected bearing.
   c) Compute the probability of the selected bearing surviving 25000 hours.   (15M)

3) Design an over hung crank shaft for the following data
   ➤ Maximum load on the crank pin for maximum torque position = 50KN
   ➤ Crank radius = 200 mm
   ➤ Distance between crank pin centre near b bearing center = 300 mm
   ➤ Allowable stress in bending = 70 MPa
   ➤ Allowable stress in shear = 50 MPa
   ➤ Allowable stress in bearing = 7 MPa   (15M)

4) Select a suitable V – belt and design the drive for a wet grinder. Power is available from a 0.5 KW motor running at 750 rpm. Drum speed is to be about 100 rpm. Drive to be compact. (15M)

5) Design a pair of spur gears to transmit 20 KW at a pinion speed of 1400 rpm. The transmission ratio is 4. Assume suitable materials and stresses.   (15M)

6) Design a bevel gear drive to transmit 7 KW at 1600 rpm for the following data:
   ➤ Gear ratio is 3,
   ➤ Material for pinion and gear is C45 steel and
   ➤ Life is 10,000 hours   (15M)

7) Design a screw jack for lifting a load of 50 kN through a height of 0.4 m. The screw is made of steel and nut of bronze. Sketch the front sectional view. The following allowable stresses may be assumed
   For steel : Compressive stress = 80 MPa ;
            Shear stress = 45 MPa
   For bronze : Tensile stress = 40 MPa ;
            Bearing stress = 15 MPa;
            Shear stress = 25 MPa.
   The coefficient of friction between the steel and bronze pair is 0.12. The dimensions of the swivel base may be assumed proportionately. The screw should have square threads. Design the screw, nut and handle. The handle is made of steel having bending stress 150 MPa (allowable).
                                                                   (15M)

8. The input to worm gear shaft is 18 KW and 600 rpm. Speed ratio is 20. The worm is to be hardened and the wheel is made of chilled phosphor bronze. Considering wear and strength, design worm and worm wheel.   (15M)