School of Engineering and Applied Science (SEAS), Ahmedabad University

Name: _____ Roll no.: _____

B. Tech. (Mechanical): Semester IV
Computer Aided Design and Manufacturing (MEC206): End Term Exam (Winter Sem.:2024);
Marks: 50 M, Wt.: 35 %
April 22, 2024, Monday, 8.00 AM – 10.00 AM

Instructions:

1 All questions are compulsory.
2 Figures to the right indicate full marks.
3 All acronyms and symbols carry their usual meaning.
4 Assume suitable data wherever necessary and specify it clearly in your answers.

---

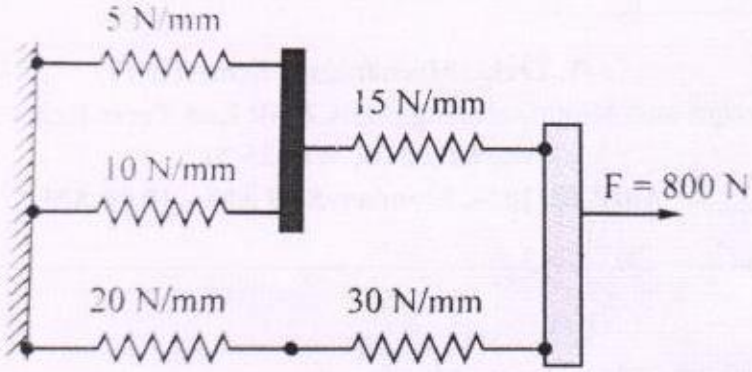
1. (a) What is a shape function? Describe its properties. **[3]**

(b) Derive the shape function of the 1-D truss element. **[5]**

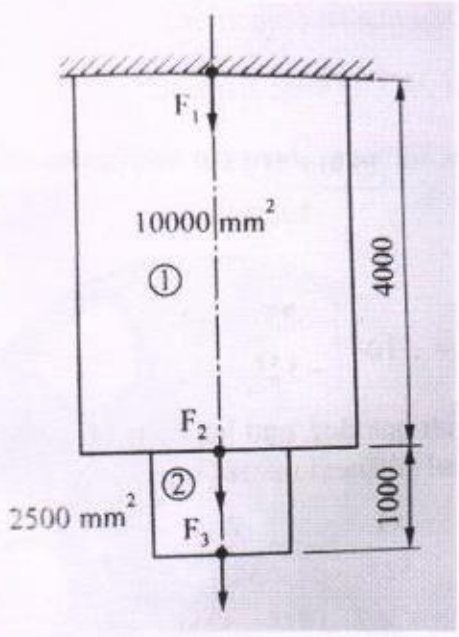
(c) How does the finite element software show the continuous color distribution in the contour plot of results, as shown below: **[2]**



2. A cluster of 5 springs is shown below. One end of the assembly is fixed, and a force of 800 N is applied at the end. Using the finite element method, determine the deflection of each spring and the reaction forces at support. **[10]**

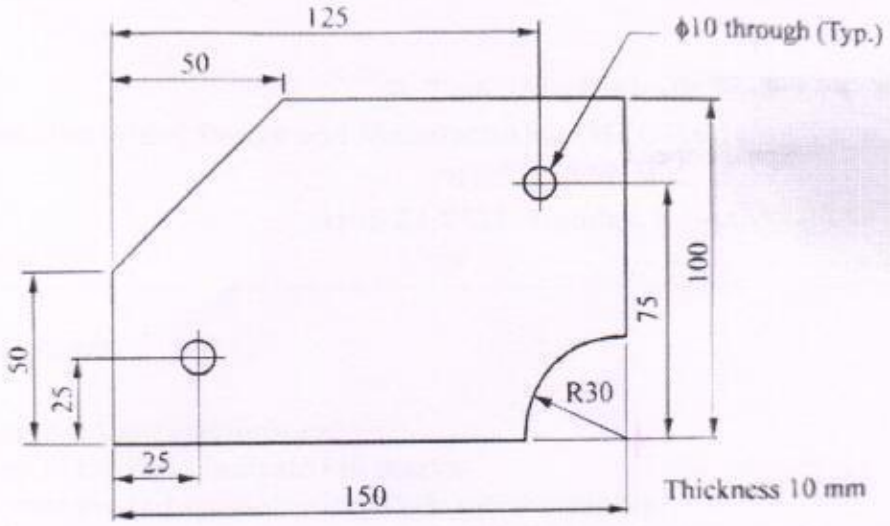


3. A rectangular section of steel bar is suspended vertically from the top edge shown in Fig. Model this as two linear elements and find the assembled stiffness matrix. Evaluate the extension of the bar under self-weight. Assume the modulus of elasticity as 2.1×10^5 MPa and the density as 8000 kg/mm^3. **[10]**



4. Write a manual part program for the component shown in Fig. Assume the raw product is cast iron and the machining is to achieve the various dimensions. The following data is available for the machining operation: **[10]**

Drill dia- 10 mm
Cutting speed- 18m/min
Milling cutter dia- 10 mm
Feed per tooth- 0.15 mm/tooth
Number of teeth on the cutter-4
Milling cutting speed- 15 m/min



5. Plot the bezier curve having endpoints P_0 (0,0) and P_3 (7,0). The control points are P_1 (7,0) and P_2 (7,6). Plot the values for u= 0.5 and 1 if the characteristics polygon is drawn in the sequence P_0-P_1-P_2-P_3. **[10]**

All the best
