

Roll No .....

**MMIP-205****M.E./M.Tech., II Semesters**

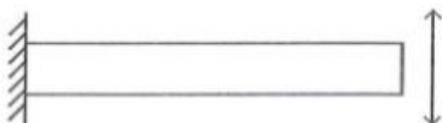
Examination, December 2017

**Finite Element and Computer Aided Engineering****Time : Three Hours****Maximum Marks : 70****Note:** i) Attempt any five questions.

ii) All questions carry equal marks.

iii) Assume suitable data, if any.

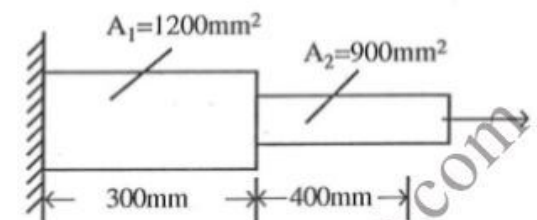
1. a) Write the general description of the FEM? 7  
b) Write down the governing equation for two dimensional steady state heat conduction? 7
2. Derive the lagrangian polynomials the shape function for a one dimensional three noded bar element. Plot the variation of the same hence derive the stiffness matrix and load vector? 14
3. a) Describe different methods of applying boundary conditions in FEM? 7  
b) Derive stiffness matrix for a 1D bar element under axial loading? 7
4. Determine the first two natural frequencies of transverse vibration of the cantilever beam shown in fig. and plot the mode shapes. 14



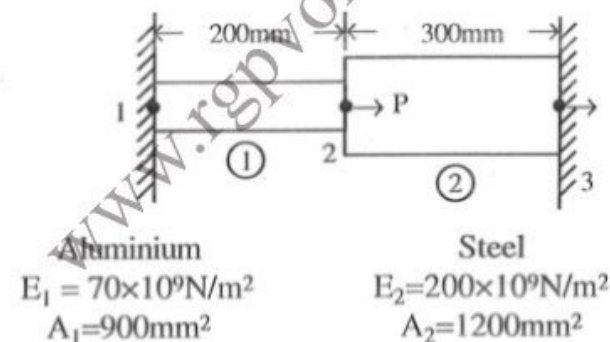
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5. a) What is CAE? What is its importance in product development? 7  
b) Give a brief description of different product data exchange format? 7
6. Consider axial vibration of the steel bar as shown in fig. Develop the global stiffness and mass matrix. Determine the natural frequency and mode shapes? 14



7. Determine the displacement and support reactions for the uniform bar shown in fig.  $P = 300\text{kN}$ . 14



8. Write short notes (any three): 14  
a) Properties of the stiffness matrix.  
b) Patch test  
c) Element connectivity  
d) Pascal triangle

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