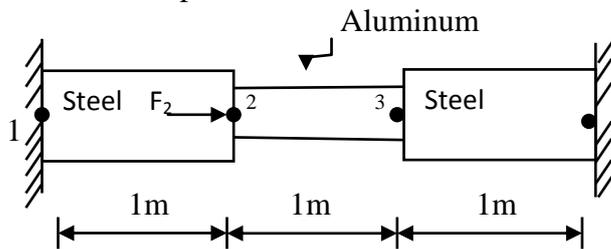


“Please check whether you have got the right question paper.”

- i) Solve any two questions from section A and section B each
- ii) Use of nonprogrammable calculator is permitted.
- iii) Assume suitable data, if necessary.

SECTION A

- Q.1 a) State and explain general steps used in the solution using the finite element method. 10
 b) Explain direct approach and energy approach used to formulate element matrices in finite element method. 10
- Q.2 a) Derive interpolation functions for two dimensional four noded rectangular element in Cartesian coordinates .Hence write interpolation functions in natural coordinates 10
 b) Temperature distribution in a steel plate is simulated using the linear type triangular element with the nodal coordinates of $(x_1 = 1, y_1 = 1)$; $(x_2 = 8, y_2 = 0.5)$ And $(x_3 = 4, y_3 = 5)$.The nodal values of temperature $\{\theta\}$ at different nodes are $\{25, 27, 23\}$ respectively. Find the value of temperature at point $(3.5, 3.5)$ 10
- Q.3 a) Write element stiffness matrix for beam element. 05
 b) Analysis the composite axial bar shown in the figure no.1, if $F_2 = 12KN$ and $U_4 = 2MM$. Use $E_{st}=200Gpa$; $E_{al}=70 Gpa$; $A_{st}=2 \times 10^{-2}m^2$; $E A_{al} = 1 \times 10^{-2}m^2$ 15



SECTION-B

- Q.4 Explain formulation of two node iso parametric Line element (Bar element). 20
- Q.5 Matrix equation $[K]_{4 \times 4} \{q\}_{4 \times 1} = \{f\}_{4 \times 1}$ has been defined where. 20

$$[K] = \begin{bmatrix} 20 & -20 & 0 & 0 \\ -20 & 40 & -20 & 0 \\ 0 & -20 & 40 & -20 \\ 0 & 0 & -20 & 20 \end{bmatrix};$$
 $\{q\} = [q_1, q_2, q_3, q_4]^T$ and
 $\{F\} = [10, 20, 20, 10]^T$
 Condense q_2 and q_3 modify the equation to $[K']_{2 \times 2} \{q'\}_{2 \times 1} = \{f'\}_{2 \times 1}$ Where $\{q'\} = [q_1, q_4]^T$.
- Q.6 Explain step by step formulation of a triangular element for axi-symmetric analysis. 20