

Total No. of Questions : 8]

SEAT No. :

P4112

[Total No. of Pages : 2

[4760] - 1032

M.E. (Civil) (Structures) (Semester - II)

FINITE ELEMENT METHOD

(2013 Pattern) (Credit System)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) Answer any Five from Eight questions.*
- 2) Neat sketches must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Use of non-programmable calculator.*
- 5) Assume suitable data, if necessary.*

- Q1)** a) Explain approximate methods of solution. [4]
b) Explain physical significance of variational approach when applied to cantilever beam loaded with UDL along its span. [6]
- Q2)** a) Explain the displacement model for 2D triangular element using polynomial function. [4]
b) Derive the linear model for triangular element in terms of interpolation function. [6]
- Q3)** a) Derive shape function for first order rectangular element. [4]
b) Derive stiffness vector for constant strain triangle using variational principle. [6]
- Q4)** a) Derive shape function using natural coordinates for one dimensional bar element. [4]
b) Derive shape function using natural coordinates for beam element. [6]

P.T.O.

- Q5) a)** Explain axisymmetric problem with suitable example. [3]
- b)** A prismatic stepped bar is made of steel and Brass. Each portion being 200 mm long. Both, steel and brass ends of the bar are welded to machine part. The junction of steel and brass portion is subjected to axial force of 2000N, compressing brass. as shown in Fig 1. Find the reactions at welded ends. Also find nodal displacement for the stepped bar. $E_{st} = 200 \text{ Gpa}$, $E_{Br} = 100 \text{ Gpa}$, $\mu_{st} = 0.29$, $\mu_{br} = 0.25$. [7]

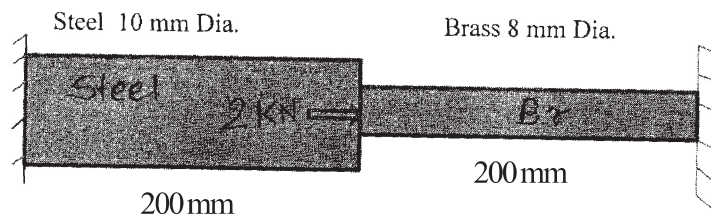


Fig. - 1

- Q6) a)** Explain rectangular plate element with 12 DOF. [5]
- b)** Explain compatibility conditions for 12 DOF plate element. [5]
- Q7) a)** Sketch various 2D and 3D isoparametric elements, state its application with suitable engineering example. [6]
- b)** Explain Bogner fox element. [4]
- Q8) a)** Explain shape function for geometry for a typical curved shell element. [5]
- b)** Write the strain Displacement Matrix for the curved shell element. [5]

