B

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SECOND SEMESTER M.TECH. DEGREE EXAMINATION, APRIL 2018

Computer Aided Structural Engineering

10CE6104: FINITE ELEMENT METHOD

Max. Marks : 60 Duration: 3 Hrs

Part A (Modules I - II)

(Answer any two questions : 2 x 9 = 18 Marks)

1. Explain the various approximate methods for solving differential equations. (9)
2. Find the approximate solution for U(x) for the beam shown in Figure (1) using principle of minimum potential energy. Use (a) linear function as trail solution (b)Quadratic function as trail solution (9)

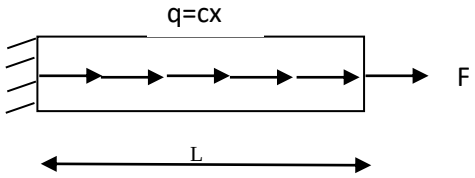
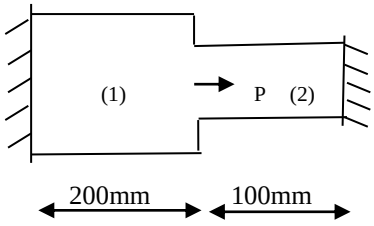


Figure (1)

3. Find the nodal displacement and reaction components of the system shown in Figure (2) (9)



$A_1=1000mm^2, A_2=2000mm^2, E_1=200Gpa, E_2=83Gpa$

Figure (2)

Part B (Modules III - IV)

(Answer any two questions : 2 x 9 = 18 Marks)

4. What are the prerequisites for the selection of displacement function in FEM? (9)
5. Derive the shape function of four noded rectangular element in Cartesian coordinate. Also plot the variation of shape function. (9)

6. (i)Define Interpolation Function. (3)
   (ii) Derive the shape function for a CST element. Also plot the variation of shape function. (6)

Part C (Modules V & VI)

(Answer any two questions : 2 x 12 = 24 Marks)

7. (i)Check the validity of isoparametric mapping for the element shown in Figure (3). (9)

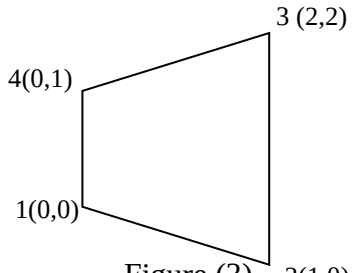


Figure (3)

(ii)Check the validity of isoparametric formulation of CST element shown in Figure (4) (3)

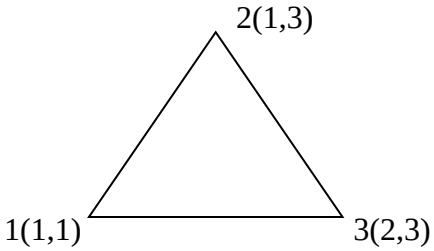


Figure (4)

8. Using two and three Gauss point numerical integration formula, evaluate the following integrals

(i) $I = \int_{-1}^{1} \cos\frac{\pi x}{2}\, dx$ (6)

(ii) $I = \int_{-2}^{2} (x + x^2)\, dx$ (6)

9. Briefly explain the formulation of axisymmetric solid element for axisymmetric loading case (12)