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JAYA GROUP OF INSTITUTIONS-THIRUNINRAVUR
6th SEM – B.E. / B.Tech
INTERNAL ASSESSMENT-1(MODEL EXAM-1)

Sub. Name: Finite Element Method
Sub. Code: AE 2351
Duration: 180 minutes

Date: 29-01-2015
Branch: Aeronautical
Max.Marks: 100

PART-A (10 x 2 =20)

1. Define Experimental and Analytical method.
2. Define Degrees of Freedom.
3. What is mean by Numerical method and its types?
4. Explain the process for Numbering of nodes and elements
5. What are the applications of FEM?
6. Write the formula using in bar element
7. Explain the four methods in weight residual method
8. Find the inverse matrix if given 'A' matrix = $2x+2y=0$; $2x+y+0z=0$; $x+y+z=0$.
9. Write the formula to find stress in an element
10. What is Discretization?

PART-B (5x16=80)

11.a) Explain the general steps in Finite Element Method

(Or)

b) A Simply supported beam is subjected to UDL over entire span. Determine the bending moment and deflection at the centre of the beam using R.R method and compare the result with exact solutions.

12.a) Determine maximum deflection of a SSB concentrated load at midspan and compare the solutions with other methods and also find moment.

(Or)

b) A bar of uniform cross section is clamped on one end and free on another end. It is subjected to uniform axial load P as shown in fig. Calculate the displacement and stress in a bar by using two term and three term polynomial.

13.a)i) The differential equation of physical phenomena is given by $\frac{d^2y}{dx^2} - 10x^2 = 5$, $0 < x < 1$. Obtain the term galerkin method solutions by using the trial functions $N_1(x) = x(x-1)$; $N_2(x) = x^2(x-1)$.

ii) Find the values of x,y,z gauss elimination method.

$$2x+4y+2z=15$$

$$2x+y+2z=-5$$

$$4x+y-2z=0$$

(Or)

b) $\frac{d^2y}{dx^2} + 500x^2 = 0$, $0 < x < 1$, trial function $y = a_1(x-x^3) + a_2(x-x^5)$. find a_1 and a_2 using all methods.

14.a) Derive the stiffness matrix for truss.

(Or)

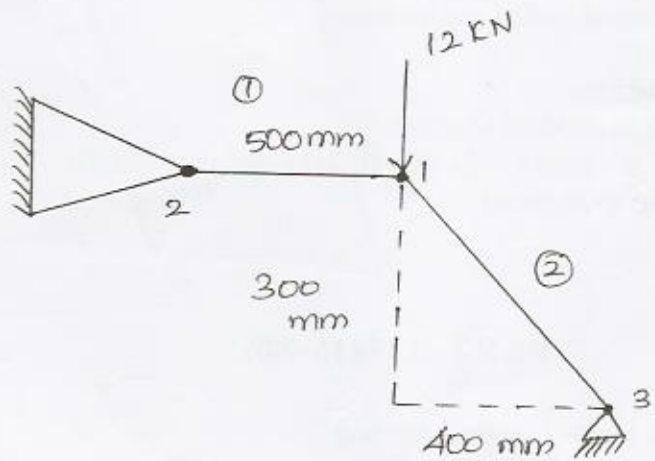
b) For the 2 bar truss shown in fig. determine the displacements of node 1 and stress in the entire element. $E=70 \times 10^9 \text{ N/m}^2$.

15.a) Consider a three bar truss as shown in fig. It is given that $E=2 \times 10^5 \text{ N/mm}^2$. Calculate i) Nodal displacement, ii) Stress in each member, iii) Reactions at the support. Area of element $A_1=2000 \text{ mm}^2$, $A_2=2500 \text{ mm}^2$, $A_3=2500 \text{ mm}^2$.

(Or)

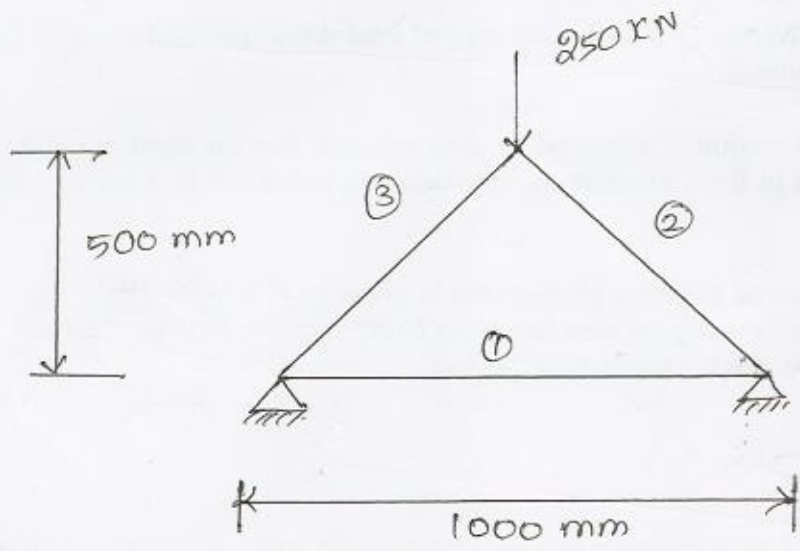
b).i) The following differential equations is available in a physical phenomenon $d^2y/dx^2+50=0$, $0 < x < 10$. Trial functions, $y=a_1 x(10-x)$, B.C. $y(0)=0$, $y(10)=0$. Find out the values of parameter a_1 using all the four methods.

ii) $d^2y/dx^2+500x^2=0$, $0 < x < 1$, trial function $y=a_1(x-x^4)$. B.C i) $y(0)=0$, ii) $y(1)=0$. Calculate a_1 values for all four methods.



$$A = 200 \text{ mm}^2$$

14 (b)



15 (a)