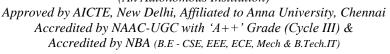


SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)





COIMBATORE-641 035, TAMIL NADU

DEPARTMENT OF AEROSPACE ENGINEERING

Faculty Name : Dr.M.Subramanian,

Prof & Head/ Aerospace Academic Year

2024-2025 (Odd)

Year & Branch

III Aerospace

Semester

. .

Course

19ASB302 – Finite Element Method for Aerospace

Unit:

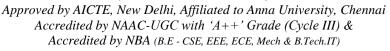
The differential equation of a physical phenomenon $\frac{d^2y}{dx^2} + y = 4x$ $0 \le x \le 1$. Total functions $(y = a_1x(x-1) + a_2x) = 0$ y(0)=9,y(1)=1. One tour approximate solution by galerkin's method of weighted residue. Solution: Verify boundary condition. y=a1x(x-1) y(0) = a1(0)(0-1) 4(1) = 01 (1) (1-1) Here the boundary conditions are not homogenea so we assume a total function as y=a1x(x-1)+x y(0) = a, (x2-x)+x = a, x0 -y(0) = 0 $y(1) = a_1(1)(1-1)+1$ Residual

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Unit:

$$\frac{d^{2}y}{dx^{2}} = a_{1}(2)$$

$$= 2a_{1}$$

$$\frac{d^{2}y}{dx^{2}} + y = 4x$$

$$2a_{1} + y = 4x \longrightarrow \emptyset$$
Sub the y value in \emptyset .
$$da_{1} + a_{1}x(x-1) + x = 4x$$

$$da_{1} + a_{1}x^{2} - a_{1}x + x = 4x$$

$$da_{1} + a_{1}x^{2} - a_{1}x + x - 4x = R(x)$$
Galorkin Method
$$\int wi Rx dx = 0$$

$$y = a_{1} \times (x-1) + x$$

$$= a_{1}w_{1} + x$$

$$w_{1} = x(x-1).$$

$$\int x(x-1) \left[2a_{1} + a_{1}x^{2} - a_{1}x + x - 4x \right] dx = 0.$$

$$\int x(x-1) \left[2a_{1} + a_{1}x^{2} - a_{1}x - 3x \right] dx = 0.$$

$$\int \left[2a_{1}x^{2} + a_{1}x^{4} - a_{1}x^{3} - 3x^{3} - 2a_{1}x - a_{1}x^{3} - a_{1}x^{2} + 3x^{2} \right] dx = 0.$$

$$da_{1} \left[\frac{x^{3}}{3} \right]_{0}^{1} + a_{1} \left[\frac{x^{5}}{5} \right]_{0}^{1} - a_{1} \left[\frac{x^{4}}{4} \right]_{0}^{1} - 3 \left[\frac{x^{4}}{4} \right]_{0}^{1}$$

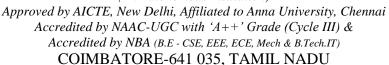
$$-2 \left[\frac{x^{2}}{2} \right]_{0}^{1} - a_{1} \left[\frac{x^{4}}{4} \right]_{0}^{1} + a_{1} \left[\frac{x^{3}}{3} \right]_{0}^{1} + 3 \left[\frac{x^{3}}{3} \right]_{0}^{1} = 0.$$

Prepared: Dr. M. Subramanian/Professor & Head Aerospace Engineering



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 \mathbf{V}

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$$\frac{2a_{1}}{3} + \frac{a_{1}}{5} - \frac{a_{1}}{4} - \frac{3}{4} - \frac{2a_{1}}{2} - \frac{a_{1}}{4} + \frac{a_{1}}{3} + \frac{3}{3} = 0.$$

$$0.666a_{1} + 0.2a_{1} - 0.25a_{1} - 0.75 - a_{1} - 0.25a_{1} + 0.333a_{1} + 1 = 0.$$

$$-0.301 a_{1} = -0.25$$

$$a_{1} = 0.830.$$

$$y = 0.830 x(x-1) + x$$

$$= 0.830 x^{2} - 0.830 x + x$$

$$= 0.830 x^{2} + 0.17 x.$$

Prepared: Dr. M. Subramanian/Professor & Head Aerospace Engineering