SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

(An Autonomous Institution)

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF AERONAUTICAL ENGINEERING

16ME401 Finite Element Analysis

IV Year VII Sem

Unit I Introduction

Topic – Rayleigh-Ritz Method-Steps

SNS Design Thinkers

Dr.M.SUBRAMANIAN, Professor& Mechanical Engineering

Rayleigh-Ritz Method-Steps

Setting an approximation function

Step1

Either polynomial

$$y = a_0 + a_1 x + a_2 x^2 + \cdots$$

Or trigonometric

$$y = a_1 \sin\frac{\pi x}{l} + a_2 \sin\frac{3\pi x}{l} + \cdots$$

Ritz Steps

Step:2

Strain Energy (U)

$$U = \frac{EI}{2}\int_0^l \left(\frac{d^2y}{dx^2}\right)^2 dx$$

Step:3

Work done (H)

$$H = \int_0^l wydx$$

Step:4

Total Energy

$$\pi = U - H$$

Step:5

Finding Rayleigh-Ritz parameter

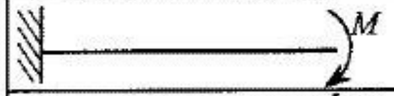
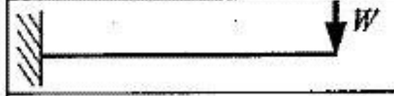
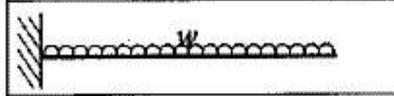
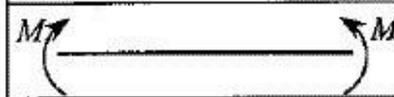
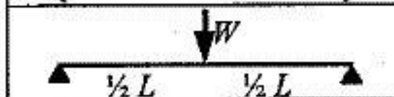
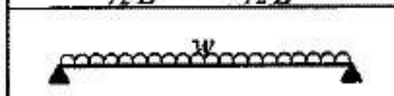
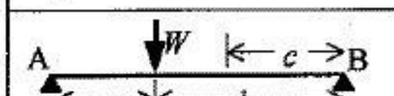
$$\frac{\partial \pi}{\partial a_1} = 0 \; ; \quad \frac{\partial \pi}{\partial a_2} = 0$$

Step:6

Determine the deflection, Bending moment stresses

Check Google classroom for a Lecture material

BEAM BENDING

L = overall length W = point load, M = moment w = load per unit length	End Slope	Max Deflection	Max bending moment
	$\frac{ML}{EI}$	$\frac{ML^2}{2EI}$	M
	$\frac{WL^2}{2EI}$	$\frac{WL^3}{3EI}$	WL
	$\frac{wL^3}{6EI}$	$\frac{wL^4}{8EI}$	$\frac{wL^2}{2}$
	$\frac{ML}{2EI}$	$\frac{ML^2}{8EI}$	M
	$\frac{WL^2}{16EI}$	$\frac{WL^3}{48EI}$	$\frac{WL}{4}$
	$\frac{wL^3}{24EI}$	$\frac{5wL^4}{384EI}$	$\frac{wL^2}{8}$
 $a \le b,\quad c = \sqrt{\frac{1}{3}b(L+a)}$	$\theta_B = \frac{Wac^2}{2LEI}$ $\theta_A = \frac{L+b}{L+a}\theta_B$	$\frac{Wac^3}{3LEI}$ (at position c)	$\frac{Wab}{L}$ (under load)

Thank you