PRN:		Course Code :	AER3604

Third Year **B. Tech** End Semester Examination Summer 2024

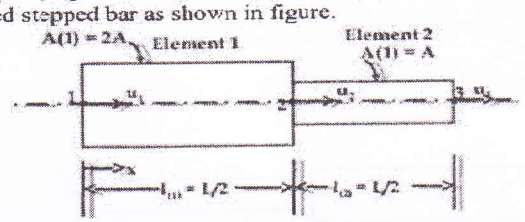
Finite Element Method

Day and Date: 30 May 2024, Thu Max Marks: **50**

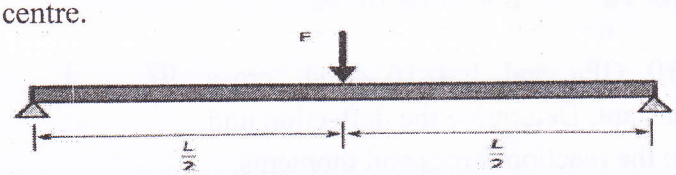
Time : 02:00PM To 04:00PM Duration: **02** hrs

Instructions: All questions are compulsory.

		Marks	Bloom's Level	CO
Q.1	**Attempt any two from the following**			
a)	Use Gauss elimination to solve given linear algebraic equation. 10X1-7X2=7, -3X1+2.099X2+6X3=3.901, 5X1-X2+5X3=6.	06	3	1
b)	Calculate the exact integral of xe^x on the interval [0, 3] and find the absolute relative error if a gauss 1, 2, 3 integration point scheme is used.	06	3	1
c)	Find the mode shapes (Eigen vectors) for the natural frequencies of longitudin of the unconstrained stepped bar as shown in figure.	06	3	1



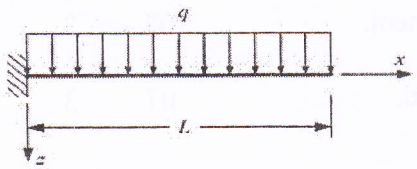
Q.2	**Attempt any two from the following**			
a)	Find the deflection at the centre using Ritz method for the simply supported beam subject to concentrated load at the centre.	06	3	2



b)	The following differential equation is available for a physical phenomenon.AE= $\frac{d^2u}{dx^2}$ + ax = 0, the boundary conditions are u (0) = 0, AE = $\frac{dy}{dx}$|x=L = 0, by using Galerkin technique, find the solution of the above differential equation.	06	3	2
c)	A cantilever beam of length L is subjected to uniform distributed load q. Use the Rayleigh-Ritz method with following assumed displacement field to find the maximum deflection of the beam, and discuss the results. The beam has a uniform bending rigidity EI.	06	3	2

(1) assume $w(x) = a_2x^2 + a_3x^3$

(2) assume $w(x) = A(1-\cos\frac{\pi x}{2L})$

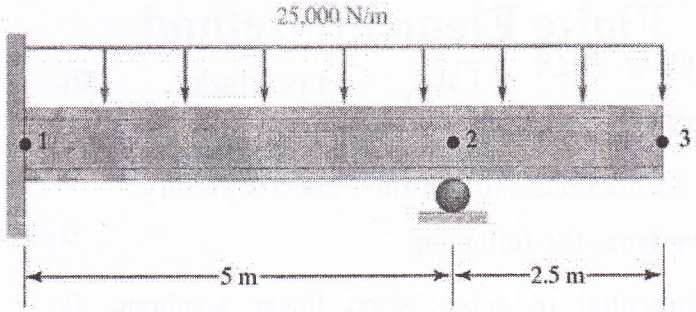


Q.3 **Attempt the following**

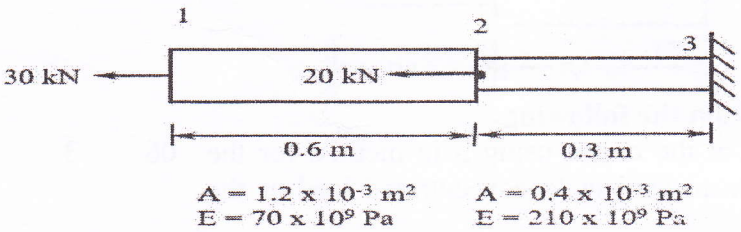
ESE

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a)	For the beam shown below, if $E = 200$ GPa, $I = 118.6\times10^{-6}$ m^4 a. Determine the vertical displacements and rotations at nodes 2 and 3 b. Reaction forces at nodes 1 and 2.	06	3	3

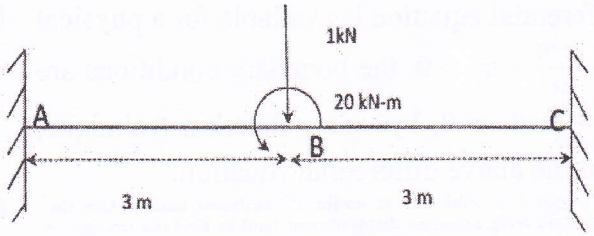


b)	An axial bar is shown below. Using the finite element method determine, (a) the nodal displacements (b) the displacement at the midpoint of element 1 and 2	07	3	3



or

b)	Given that E=210 GPa and I=4×10 -4 m4, cross section of the beam is constant. Determine the deflection and slope at point C. calculate the reaction forces and moments.	07	3	3



Q.4	**Attempt the following**			
a)	Explain pascal triangle and derive it formulation.	06	2	4
b)	Formulate the axis symmetric triangular element.	07	3	4
	or			
b)	Explain tetrahedral element with one example.	07	3	4

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