INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

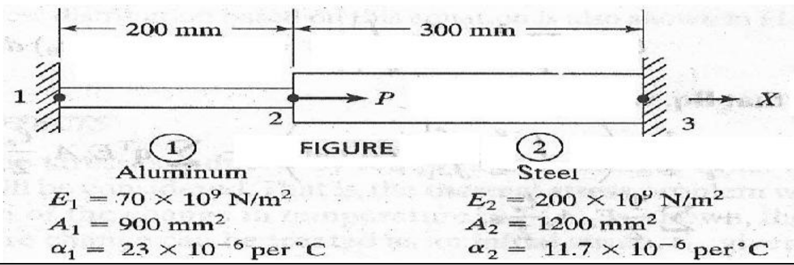
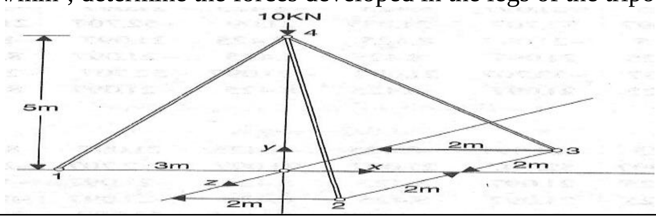
MECHANICAL ENGINEERING

ASSIGNMENT QUESTIONS

Course Name	:	**FINITE ELEMENT METHODS**
Course Code	:	**A60330**
Class	:	III YEAR II SEMESTER
Branch	:	MECHANICAL ENGINEERING
Year	:	2017 – 2018
Course Faculty	:	Prof V. V. S. H. Prasad, Professor Mr. C. Labesh Kumar, Assistant Professor.

OBJECTIVES

The aim of this course is to introduce basic principles of Numerical methods and it is further extended to cover the application of finite element method by the inclusion of 1D bar elements truss elements beam elements 2D elements like CST, ring elements. Nowadays the principles of finite element method find wide applications in many engineering fields like mechanical engineering, aerospace, civil engineering, nuclear engineering, bio mechanics etc. The course deals with the Raleigh-ritz (PMPE) and galerkin approaches. The objective of the course is determined structural deformations strains element stress and heat transfer problems.

S. No	Question	Blooms Taxonomy Level	Course Outcome
	ASSIGNMENT I		
1	Using potential energy approach, describe FE formulation for plane truss Element.	Understand	1
2	An axial load P=300X10^3N is applied at 20^0 C to the rod as shown in Figure below. The temperature is the raised to 60^0 C . a) Assemble the K and F matrices. b) Determine the nodal displacements and stresses. 	Understand	1
3	The tripod shown in figure below carries a vertically downward load of 10kN at joint 4. If Young's modulus of the material of tripod stand is 200kN/mm^2, determine the forces developed in the legs of the tripod. 	Remember	2

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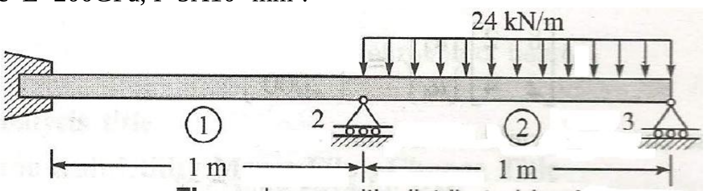
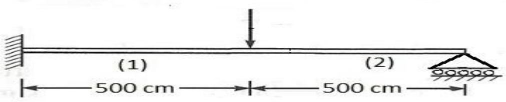
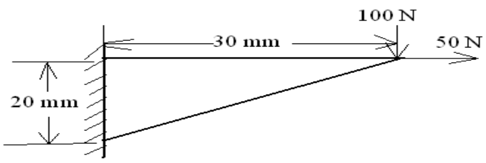
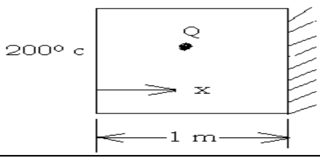
4	For the beam shown in Figure below, determine the following: a) Slopes at nodes 2 and 3. b) Vertical deflection at the mid-point of the distributed load. Consider all the elements have E=200GPa, I=5X10^6 mm^4.  **Figure** beam with distributed load	Remember	2
5	A beam fixed at one end and supported by a roller at the end, has a 20KN concentrated load applied at the centre of the span, as shown in fig. calculate the deflection under the load and construct shear force and bending moment diagram for the beam. Take E = 20 x 10^6 N/c,^{2,} I=2500 cm$^{4.}$ 	Understand	2
	ASSIGNMENT-II		
1	For the configuration shown in figure, determine the deflection at the point load application using a one element model. T = 10 mm , E = 70 G Pa ,ν = .3 	Remember	1
2	a)A four node quadrilateral element is shown in fig 1.3.the co-ordinates of each node are given in cm. The element displacement vector is given as [q]=[0 0 0.2 0 0.15 0.10 0 0.05] cm. find (i) the x, y co-ordinates of a point P whose location at ξ =0.5,ή=0.5 (ii) the displacement of point P(u,v) (iii)the jacobian at P b)Evaluate the Integral I= $\int_{-1}^{1}$ $(3\xi^2+\xi^3)$ dξ using Gaussian quadrature method	Understand	3
3	The plane wall shown in fig. The thermal conductivity K = 25W/m^{0}c and there is a uniform generation of heat in the wall of Q = 400W/m^3. Determine the temperature distribution at five nodes (include two sides of the walls) in equal distances through the wall thickness. 	Remember	2
4	a. Evaluate natural frequencies for the stepped bar shown fig. in axial vibration take E=200 GPa and DENSITY= 7850 Kg/m^3. b. Draw mode shapes and determine Eigen vector. Take A_l=400mm^2 and A_2=200mm^2 using characteristic polynomial method.	Remember	2

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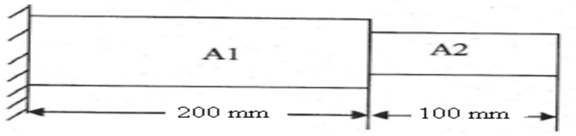
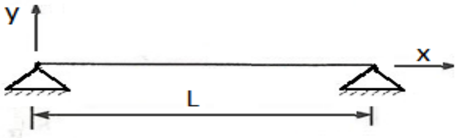
			
5	Find the approximate first two natural frequencies of a simply supported beam using on a element. Flexural Rigidity =EI; Density = Ᵽ Cross-sectional area=A 	Remember	4

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