Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2020

Programme Name: B.Tech/ADE **Semester : VIII**
Course Name : Finite Element method **Time : 03 hrs**
Course Code : ADEG471 **Max. Marks: 100**
Nos. of page(s) : 02
Instructions: Attempt all the questions as directed. Assume suitable data if required.

SECTION A

S. No.		Marks	CO
Q1	Stiffness matrix depends on …… [A] material [B] geometry [C] both [D] none	**5**	
Q2	At fixed supports, the displacements are equal to …… [A] 1 [B] 2 [C] 3 [D] 0	**5**	
Q3	Sum of all shape functions is equal to [A] Zero [B] -1 [C] +1 [D] 2	**5**	
Q4	The displacement function for 1-D ,two node linear element in terms of shape function will be [A] u = N1u2 + N2u1 [B] u = N2 u1 + N1u2 [C] u = N1u1+N2u2 [D] u = N1u1+N1u2	**5**	
Q5	For 1-D bar elements if the structure has three nodes, then the stiffness matrix formed is having the order of…….. [A] 2*2 [B] 3*3 [C] 4*4 [D] 6*6	**5**	
Q6	A triangular plane stress element has ……degrees of freedom [A] 3 [B] 4 [C] 5 [D] 6	**5**	

SECTION B

Q7	Define continuity. Differentiate between global and local coordinates.	**10**	
Q8	Explain the method of Weighted Residuals, i.e., Galerkin's Method.	**10**	
Q9	The x, y coordinates of nodes i, j and k of a triangular element are given by (2,3), (4,7) and (7,4) mm respectively. Determine the Shape functions N1, N2, and N3 at the interior point P (3.5, 5) mm for the element.	**10**	
Q10	Define the finite element and node. Explain the discretization process and types of elements used for discretization (1D, 2D and 3D).	**10**	
Q 11	Define shape function and stiffness matrix. List the characteristics of shape functions. Write the properties of the stiffness matrix.	**10**	

	(OR) An alloy bar 1m long and 200mm^2 in cross-section is fixed at one end is subjected to a compressive load of 20 kN on the other end. If the modules of elasticity for the alloy is 100 GPa, find the decrease in the length of the bar. Also, determine the stress developed and the decrease in the length at 0.25m, 0.5m, and 0.75m. Solve by FEM.		
SECTION-C			
Q 12	Explain the general description of the finite element method. Write down the advantages, disadvantages, and applications of the finite element method. (OR) Explain the weak formulation of FEA. Consider a simple one dimension structure with three elements, explain the process of stiffness matrix and load vector assembly.	**20**	