UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, July 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	The truss element can resist only …… [A] axial force [B] surface force [C] point load [D] none	5	CO1
Q2	The determinant of an element stiffness matrix is always ……. [A] 1 [B] 0 [C] 2 [D] none	5	CO2
Q3	Example of 2-D Element [A] Bar [B] Triangle [C] Hexahedron [D] Tetrahedron	5	CO1
Q4	The final global finite element equation for the complete structure can be written in the Matrix form [A] $\{F\}=[k]+\{u\}$ [B] $\{F\}=[k]-\{u\}$ [C] $\{F\}=[k]\{u\}$ [D] $\{F\}=[k]/\{u\}$	5	CO3
Q5	Stiffness matrix for 2D triangular plane stress element [A] $[B]^T[D]\,[B]\,A\,t$ [B] $[B][D]^T\,[B]\,A\,t$ [C] $[D]^T[D]\,[B]\,A\,t$ [D] $[D]^T[B]\,[D]\,A\,t$	5	CO2
Q6	The sub domains are called as [A] particles [B] molecules [C] elements [D] None	5	CO1

SECTION B

Q7	Why polynomial type of interpolation functions are mostly used in FEM?	10	CO1
Q8	During discretization, mention the places where it is necessary to place a node.	10	CO1
Q9	The x, y coordinates of nodes i, j and k of a triangular element are given by (1,2), (4,3) and (6,4) mm respectively. Determine the Shape functions N1, N2, and N3 at	10	CO2

	the interior point P (3.5, 2.95) mm for the element.		
Q10	Explains the following (i) Variational approach (ii) Weighted residual approach	**10**	**CO1**
Q 11	(i) State the assumptions made while finding the forces in a truss. (ii) Define stiffness matrix and explain its special features. (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.	**10**	**CO3**
SECTION-C			
Q 12	Consider a simple one dimension structure with four elements, explain the process of stiffness matrix and load vector assembly. Write the global finite element equation. (OR) List and briefly explain the general steps of the finite element method. Write down the advantages, disadvantages, and applications of the finite element method.	**20**	**CO3**