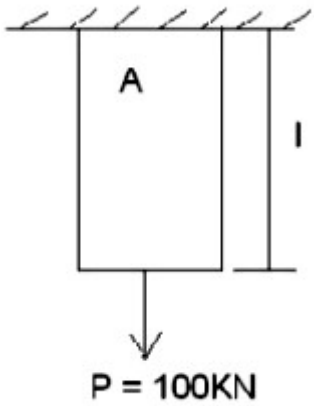
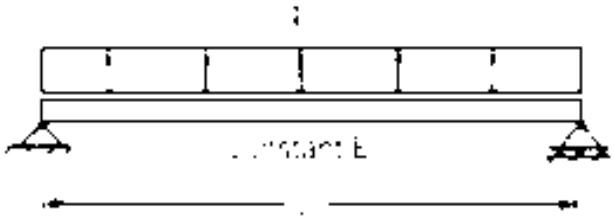
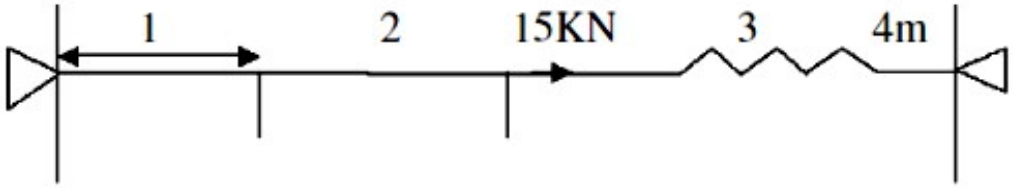
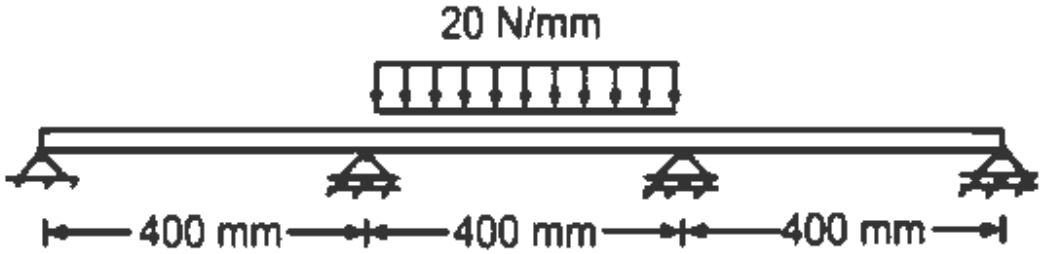
Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

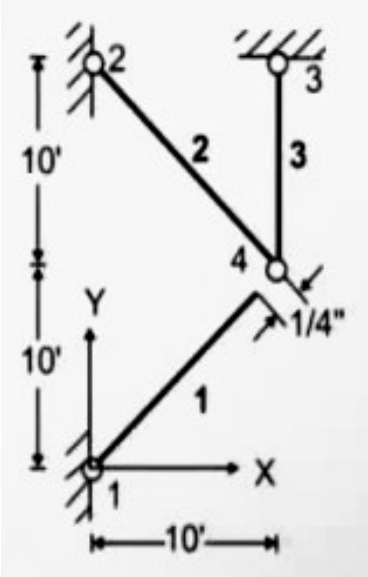
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

Course: **Finite Element Method** **Semester: II**
Program: **M.Tech. Structural Engineering** **Time 03 hrs.**
Course Code: **CIVL 7014** **Max. Marks: 100**
Pages: 3
Instructions: **Answer All Questons**

SECTION A

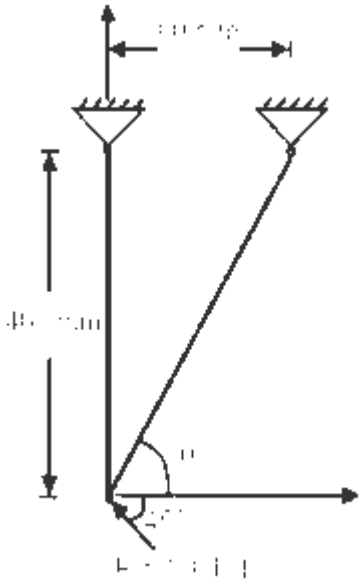
S. No.		Marks	CO
Q 1	State the methods of engineering analysis.	**4**	**CO2**
Q 2	Write down the expression of shape function N and displacement u for one-dimensional bar element.	**4**	**CO3**
Q 3	Explain Rayleigh-Ritz method.	**4**	**CO2**
Q 4	Write down the stress strain relationship matrix for plane stress conditions.	**4**	**CO1**
Q 5	Distinguish between potential energy function and potential energy functional	**4**	**CO2**
	SECTION B		
Q 6	Using Rayleigh Ritz methods calculate the deflection at the middle and end for the following cantilever beam 	**4 + 6 =10**	**CO4 CO1**
Q 7	Determine equations for Moment, shear and deflection for uniformly loaded simply supported beam with span lenhgth L. EI constant	**5 +5=10**	**CO5 CO4**

			
Q 8	For the bar assemblage as shown in fig. Determine (i)Global stiffness matrix (ii)Nodal displacement 	**5 +5 =10**	**CO2 CO5**
Q 9	Explain modified galerkin Method with suitable exapmle. OR Explain Galerkin Method with Suitable example.	**5 + 5 =10**	**CO2 CO4**
	SECTION-C		
Q 10	Find deflections, moments and shears for a continuous beam shown in figure. Assume E= 200 GPa and I = 10^5 mm^4 	**4 + 10+6= 20**	**CO3 CO5 CO1**
Q 11	Find the displacements and axial forces in the truss shown in figure below if the element 1 is fabricated ¼ inches (6.35 mm) too short and is forced to fit during assembly. Assume E = 30000 ksi (206842.8 MPa) and A= 10 in^2 (6451.6 mm^2)	**4 +10+6 =20**	**CO2 CO5 CO1**



OR

Find the axial forces and nodal displacements for a plane truss shown below. Assume area of cross section for element 1 = 1000 mm^2 and that for element 2 = 1500 mm^2, E= 210 GPa



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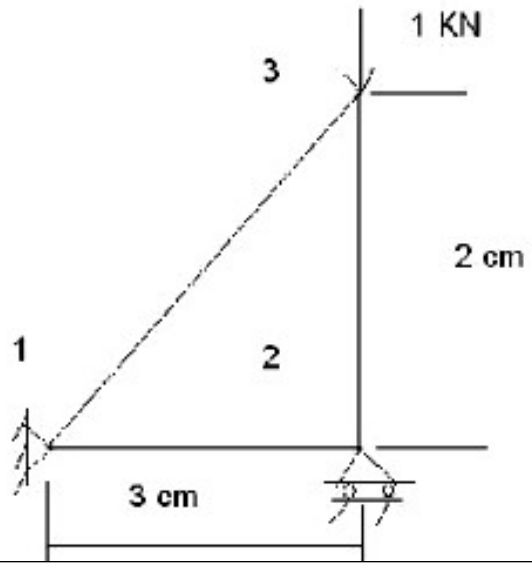
Course: Finite Element Method — **Semester: II**
Program: M.Tech. Structural Engineering — **Time 03 hrs.**
Course Code: CIVL 7014 — **Max. Marks: 100**
Pages: 2
Instructions: Answer All Questons

SECTION A

S. No.		Marks	CO
Q 1	Define shape function.	4	CO1
Q 2	State different phases of finite element method.	4	CO2
Q 3	Explain stiffness method.	4	CO3
Q 4	Name the weighted residual methods.	4	CO3
Q 5	What are the classifications of coordinates?	4	CO4

SECTION B

Q 6	Explain Gauss Integration method with Suitable examples.	5 + 5 =10	CO2 CO4
Q 7	Evaluate the displacement at node 1, 2. Take t=0.5 cm, E=2X10^7 N/cm^2, μ = 0.27 using plane stress condition. 	5 +5 =10	CO1 CO4
Q 8	Determine equations for Moment, shear and deflection for Fixed beam with UDL and span lenhgth L. EI constant	5 +5=10	CO5 CO4
Q 9	Explain Collocation Method with suitable exapmle. OR Explain Rayleigh-Ritz Method with suitable exapmle.	5 + 5 =10	CO2 CO4

SECTION-C			
Q 10	The three bar assemblage. A force of 2500N is applied in the x direction at node 2. The length of each element is 750 mm. Take E = $4*10^5$ N/mm^2 . A = 600mm^2 for elements 1 and 2.Take E = $2*10^5$ N/mm^2 and A = 1200mm^2 for element 3.Nodes 1 and 4 are fixed. Calculate the following: Global stiffness matrix, Displacements of nodes 2 and 3. Reactions at nodes 1 and 4.	**4 + 10+6= 20**	**CO3 CO5 CO1**
Q 11	Derive Three element Solution by Galerkin Method **OR** Derive Two element Solution by Galerkin Method	**10 +4 +6 =20**	**CO3 CO1 CO5**