Name: **Enrolment No:**	

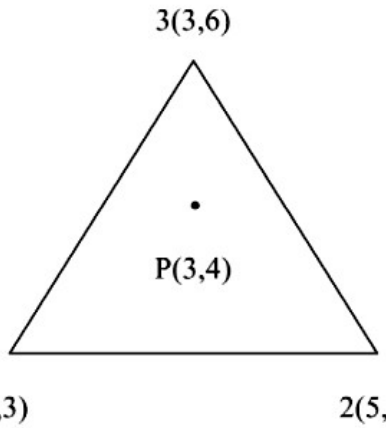
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

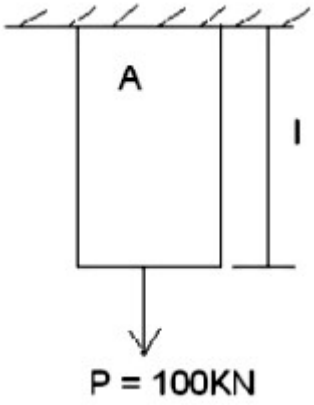
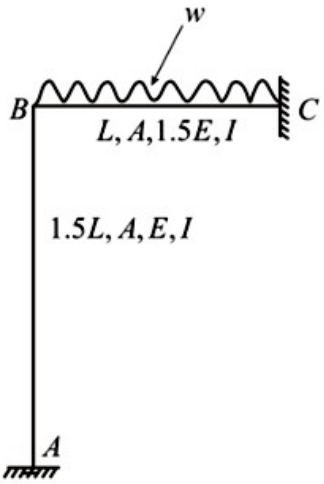
Programme Name: M.Tech. Structural Engineering **Semester : II**
Course Name : Finite Element Method **Time : 03 hrs**
Course Code : CIVL 7014 **Max. Marks : 100**
Nos. of page(s) : 2
Instructions: **Answer all questions of Section A, B & C**

SECTION A

S. No.		Marks	CO
Q 1	Explain Rayleigh-Ritz method.	**4**	**CO1**
Q 2	Explain Lagrange Elements.	**4**	**CO2**
Q 3	Write down the stress strain relationship matrix for plane strain conditions.	**4**	**CO3**
Q 4	Difference between thin plate and thick plate, Explain	**4**	**CO4**
Q 5	Define shape function.	**4**	**CO1**

SECTION B

Q 6	The coordinates of a three node triangular element is given below. Calculate the displacement at point P if the displacements of nodes 1, 2 and 3 are 11 mm, 14mm and 17mm respectively using the concepts of area coordinates.  	**10**	**CO1**
Q 7	Explain Constant Strain Triangle for rectangular elements.	**10**	**CO3**

Q 8	Using Rayleigh Ritz methods calculate the deflection at the middle and end for the following cantilever beam  	**10**	**CO1**
Q 9	Obtain Relation between Strain and Displacement; Relation between Stress and Strain for axisymmetric three dimensional elements.	**10**	**CO3**
	SECTION-C		
Q 10	Analyze the plane frame shown below. Assume the modulus of elasticity of the horizontal member is 1.5 times that of the vertical member and length of the vertical member is 1.5 times that of horizontal member. Find the bending moment and reactions at support assuming the length, cross section area and modulus of elasticity of vertical member as 3.0 m, 0.4 x 0.4 m^2 and 2 x 10^{11} N/mm^2, respectively  	**20**	**CO2**
Q 11	Formulate finite element analysis for degenerating shell element.	**20**	**CO4**