Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Mid - Term Examinations – October 2025

Date: 09-10-2025 **Time:** 02.00pm to 03.30pm

School: SOE	**Program:** B. Tech	
Course Code: MEC3005	**Course Name:** Finite Element Analysis	
Semester: V	**Max Marks**: 50	**Weightage**: 25%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Marks	**29**	**21**	**-**	**-**	**-**	**-**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. 5Q x2M=10M

1	Explain the purpose of Engineering Analysis?	**2 Marks**	**L2**	**CO1**
2	List different types of weighted residual methods and variational methods?	**2 Marks**	**L1**	**CO1**
3	List shape functions and their properties?	**2 Marks**	**L1**	**CO2**
4	Define FEM and list features of it?	**2 Marks**	**L1**	**CO2**
5	List different types of finite elements?	**2 Marks**	**L2**	**CO2**

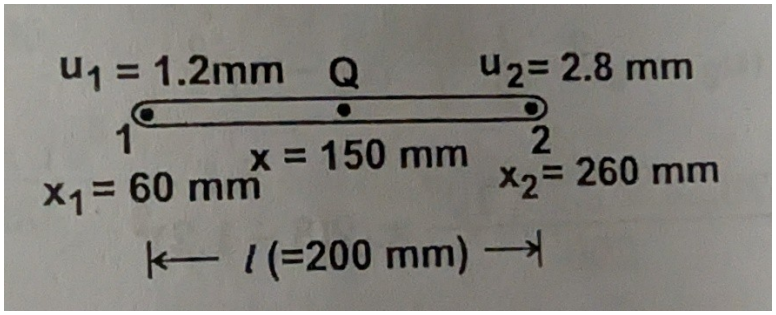
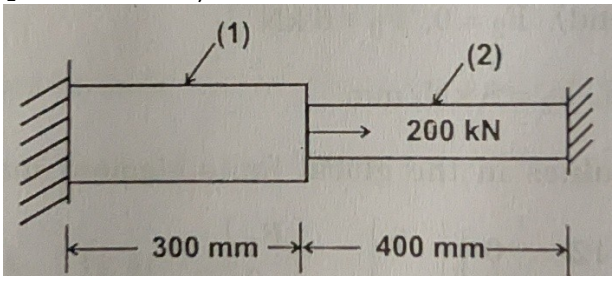
Part B

Answer the Questions. Total Marks 40 M

6.	Determine the deflection at the centre of a simply supported beam of span length l subjected to Concentrated load P at its mid-point. Use Rayleigh Ritz Method?	**10 Marks**	**L3**	**CO2**
	Or			
7.	Compute the differential Equation $d^2y/dx^2 + y + x = 0$ if 'x' limits 0 to 1, subject to boundary conditions y (0) = y (1) = 0 using Galerkin	**10 Marks**	**L2**	**CO2**

	Method? Use Trial function as $y= a_1+a_2x+a_3x^2$.			

8.	For the differential equation $(d^2y/dx^2) + 300x^2 = 0$, limiting $x = 0$ to 1 with the boundary conditions $y(0) = y(1) = 0$, assuming the trial function as $y = a_1x(1-x^4)$. determine the solution of the problem using two term trail function by using 1) point collocation method 2) sub domain collocation method 3) least square method.	**15 Marks**	**L3**	**CO1**
	Or			
9.	The physical phenomena are governed by the differential equation $(d^2y/dx^2) - 10x^2 = 5$ limiting $x = 0$ to 1. The boundary conditions are given by D (0) = D (1) =0. By taking a two-term trial solution as $D(x) = G_1 f_1(x) + G_2 f_2(x)$ with $f_1(x) = x^2(x-1)$ and $f_2(x) = x^3(x-1)$, determine the solution of this problem using Galerkin Method.	**15 Marks**	**L3**	**CO1**

10.	A rod of diameter 10 mm, length 200 mm has nodal displacement due to axial loads as 1.2 mm and 2.8 mm. The position of rod is shown in figure 1. Calculate i) the displacement of point 'Q' on the rod. Also find ii) stress iii) the strain energy of the rod. Take E = 210 GPa. Use matrix method.  Figure 1	**15 Marks**	**L3**	**CO2**
	Or			
11.	A stepped bar is subjected to an axial load of 200 kN at the place of change of cross section and material as shown in the figure 2. Calculate a) The nodal displacements b) The reaction forces c) The induced stress in each material. Considering Aluminium (1st Bar) and steel bar (2nd Bar) and take A_1 = 2400 mm^2 and A_2 = 600 mm^2 and $E_1 = 70 \times 10^3$ N/mm^2 and $E_2 = 200 \times 10^3$ N/mm^2.  Figure 2	**15 Marks**	**L3**	**CO2**