Seat No: _____ Enrollment No: _____

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

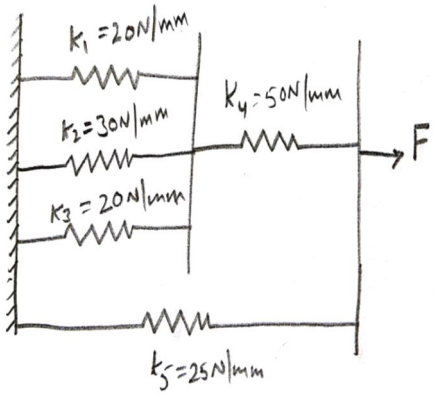
M.Tech. Winter 2018 - 19 Examination

Semester: 1 **Date: 11/12/2018**
Subject Code: 203219102 **Time: 10:30am to 1:00pm**
Subject Name: Finite Element Analysis in Design and Manufacturing **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

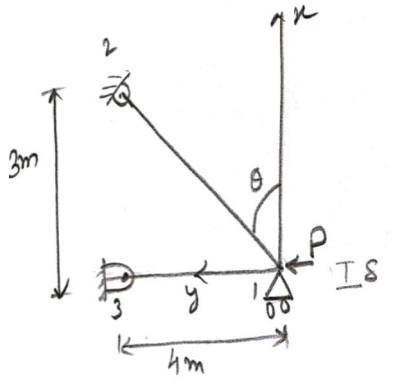
Q.1 A) What is shape function? Explain its physical significance. **(05)**
B) Determine stiffness matrix for two springs in series. **(05)**
C) Differentiate between FEM & conventional analytical method. **(05)**

Q.2 **Answer the following questions**. (Attempt any three) (Each five mark) **(15)**
A) Discuss formulation of the finite element method for heat conduction.
B) A system of spring as shows in fig. Determine the global stiffness matrix & deflection the each spring.

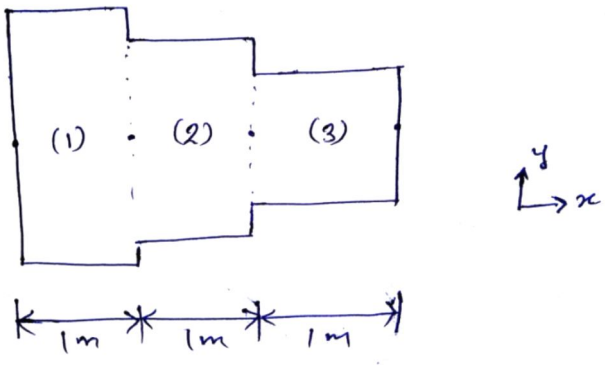


C) Explain finite element method for plasticity.
D) Explain discretization of an element, node & degree of freedom.

Q.3 A) For the two bar truss shown in fig. determine the displacement in the y- direction of nodal &the axial force in each element. A force of P=1000KN is applied at node in positive Y=direction while node settles amount σ = 50mm in negative x= Direction. Let E=210Gpa & A=6*10^{-4}mm for each element. **(07)**



B) For the smooth pipe of variable cross section, shown in fig. determine the potential at the junction, the velocity in each section of pipe & volumetric flow rate. The potential at the left end & is p_1=10 m^2/s & that at the right end is p_4=1m^2/s. **(08)**

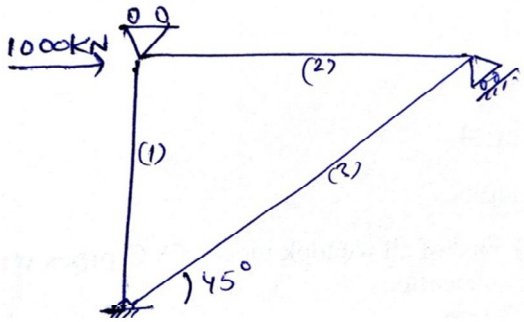


OR

B) A local member with loading is initially done 20^0 C the temp. That rises to 60^0C. Determine the nodal displacement & elemental stresses developed. Assume that **(08)**

Element	Modulus of elasticity	Coefficient of thermal efficiency
1	72Gpa	$2.3*10^{-6}/^0$c
2	210Gpa	$12*10^{-6}/^0$c

Q.4 A) For the plane truss shown in fig. Determine the displacement & reaction. Let E=210Gpa, A= $6*10^{-4}m^2$ for element (1) & (2) , & A=$6\sqrt{2}*10^{-4}m^2$ for element (3). **(07)**



OR

A) For a thin plate 4*3m subjected to the surface traction. Determine the nodal displacement & the element stress. The plate thickness t=1mm in; E=$30*10^{-6}$ Mpa & V=0.30. **(07)**

B) In a triangular element, the nodes 1,2 & 3 and co-ordinates (30,40) , (140,70)&(80,140) respectively . The displacement in mm , at nodes 1,2&3 ;(0.1,0.5), (0.6,0.5) & (0.4,0.3) respectively. The points p within the element has co-ordinate (77,96) for point p determine. **(08)**

i. The natural coordinate.
ii. The displacement.
iii. The shape function.