TE/Prod/Choice Based/May-2019/07/06/2019

Time: 3 Hours **Marks: 80**

N.B:

1. Question No.1 is compulsory.
2. Illustrate your answer with neat sketches wherever necessary.
3. Missing data may be assumed suitably.
4. Figures to the right indicate full marks.

Q.1 Write a short note on following: **(20)**

a) What is the significance of shape function.
b) H-method & P-Method in FEA.
c) Explain sources of error in FEA.
d) What is a consistent and lumped mass matrix.
e) Meshing & Compatibility of Elements.

Q.2

a) Given Differential equation **(10)**

$3\frac{d^2u}{dx^2} + u + x = 0; 0 < x < 1$ With boundary conditions u(0)=1= u(1)=2.

Find solution at x =0.5 by using Galerkin Method.

b) Find the natural frequency of axial vibration of a bar of uniform cross section of 20 mm^2 and of length 1m. Take E= 2 $X10^5$ N/mm^2. and ρ=8000 kg/m^3. Take two linear element. **(10)**

Q.3

a) Derive the shape function for a rectangular element in local coordinate system. **(10)**
b) Solve the following: **(10)**

$3Y''-8Y'+3x^2 = 0; 0 \leq x \leq 1$

Y(0)=0 Y(1)=2 Find y(0.5) & y(0.7) using Least square method.

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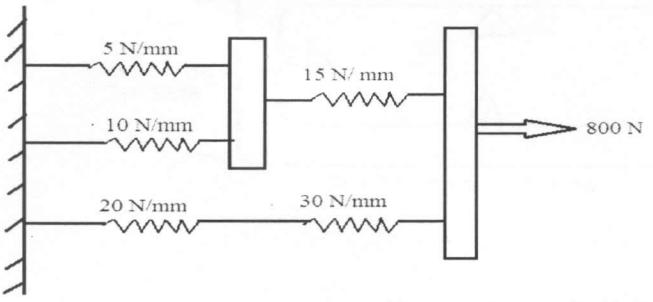
Q.4

a) Figure show cluster of springs. One end of the assembly is fixed and force is applied at the end. Using the finite element method, determine:

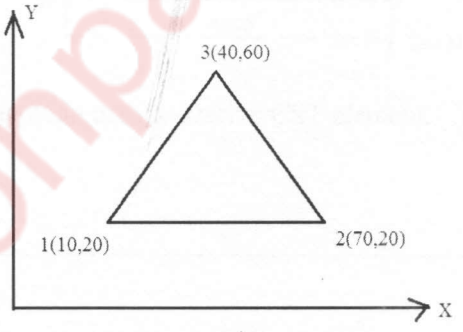
i)The deflection of each spring. ii) The reaction forces at supports. **(12)**



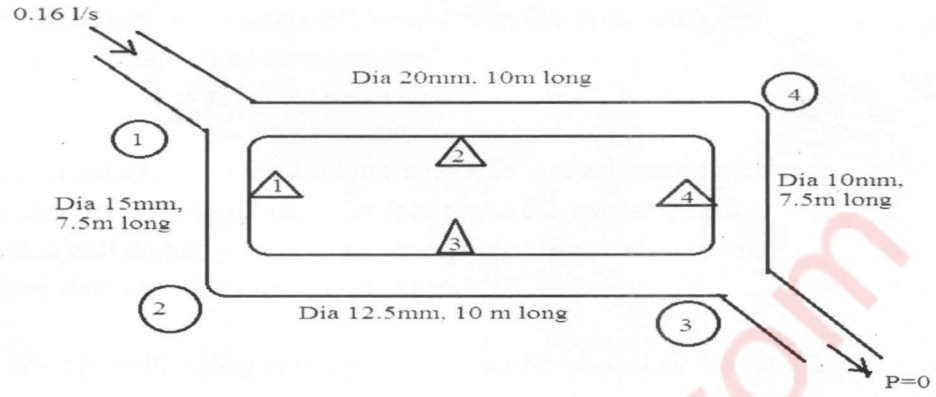
b) Obtain the strain nodal displacement relationship for one dimensional linear element. **(8)**

Q.5

a) Evaluate the stiffness matrix for the CST element shown below. Coordinate are given below in mm. Assume plane stress condition.Thickness=10mm,E= 200GPa and γ =0.3. **(10)**

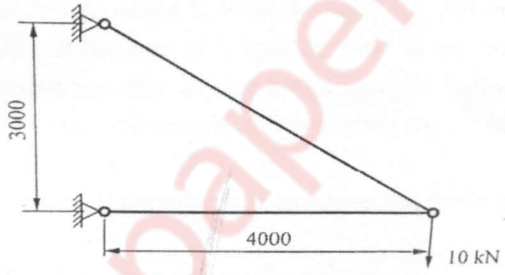


b) For the fluid flow network shown in figure determine pressure at nodes in pipes. **(10)**



Q.6

a) For the two bar truss shown is figure, determine the displacement at nodes. **(12)**
E= 70GPa & A=200 mm^2



b) Explain significance of Jacobian matrix. Derive CST element. **(8)**