Reg. No. : | | | | | | | | | | |

Question Paper Code: 37702

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Seventh Semester

Mechanical Engineering

01UME702 - FINITE ELEMENT ANALYSIS

(Regulation 2013)

Duration: One hour Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. Which one is Numerical method?

   (a) Functional Approximation (b) Finite Difference Method (FDM

   (c) Finite Element Method (FEM) (d) All the above

2. . …… method is most commonly used for solving simultaneous linear equations. This method is easily adapted to the computer for solving such equations.

   (a) Weighted residuals method (b) Rayleigh-Ritz method
   (c) Gaussian Elimination method (d) All the above.

3. When the aspect ratio increases, the accuracy of the solution

   (a) Increases (b) Decreases

   (c) Neither increases nor decreases (d) None

4. The derivative of sum of the shape functions within the element is equal to __

   (a) 0 (b) -1 (c) 1 (d) more than one

5. When there are less geometric nodes than shape function nodes then the element is called

   (a) Sub parametric (b) Super parametric (c) Iso parametric (d) None

6. When thin plate is subjected to loading in its own plane only, the condition is called

(a) Plane stress (b) Plane strain (c) Axi-symmetric (d) General

7. All the calculations are made at limited number of points known as

(a) Elements (b) Nodes (c) Discretization (d) Mesh

8. Sum of shape functions is

(a) +1 (b) -1 (c) 0 (d) Infinity

9. ANSYS uses

(a) frontal solution (b) banded matrix solution

(c) Cramer's rule (d) Cholesky decomposition

10. The normal stress is the same in all directions at a point in a fluid, when the fluid is

(a) non-viscous

(b) incompressible

(c) both (a) and (b)

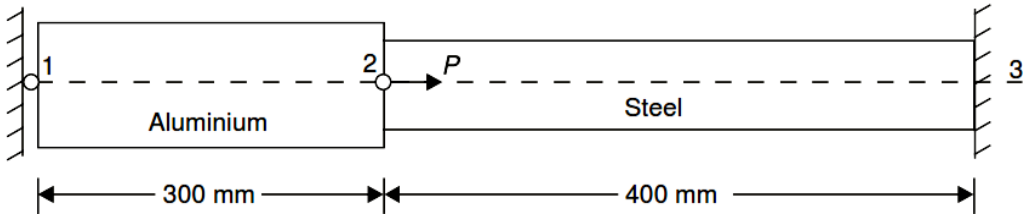
(d) having no motion of one fluid layer relative to the other.

PART – B (3 x 8= 24 Marks)

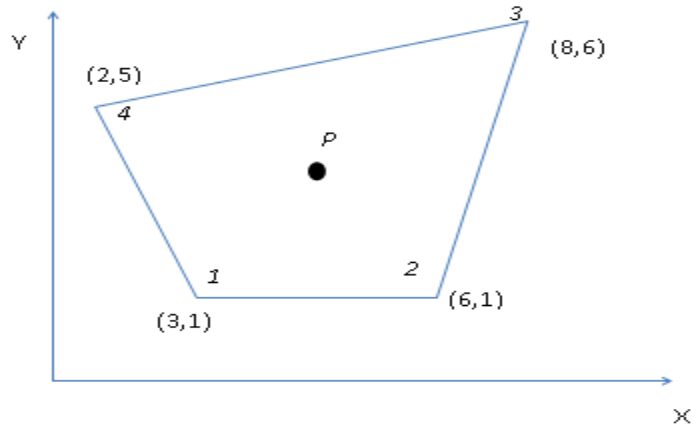
(Answer any three of the following questions)

11. The differential equation of the physical phenomenon is given by $d^2y/dx^2 + 500x^2 = 0;\ 0 \le x \le 1$, by using the trail function, $y = a_1(x - x^3) + a_2(x - x^5)$ solve using weighted residual methods. (8)

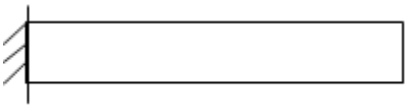
12. Determine the nodal displacement at node 2, stresses in each material and support reactions in the bar as shown in figure. Due to the applied force of 400 *KN* and temperature rise of 30°*C*. Take $A_1 = 2400\ mm^2$, $A_2 = 1200\ mm^2$, $E_1 = 0.7 \times 10^5\ N/mm^2$, $E_2 = 2 \times 10^5\ N/mm^2$, $\alpha_1 = 22 \times 10^{-6\circ}\ C$ and $\alpha_2 = 12 \times 10^{-6\circ}\ C$. (8)



13. For the isoperametric quadrilateral element shown in fig. Determine the local coordinates of the point p which has Cartesian coordinates(7, 4). (8)



14. For the one dimensional bar as shown in figure, determine the natural frequencies of longitudinal vibration using two elements of equal length. Take $A = 600\ mm^2$, $E = 2 \times 10^5\ N/mm^2$, $\rho = 0.8 \times 10^{-4}\ N/mm^3$ and $L = 400\ mm$. (8)



15. Compute element matrices and vectors for the element shown in figure when the edge jk experiences convection loss. (8)