Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 07

M.Sc. Mathematics (Sem.–4)

ADVANCED NUMERICAL METHODS

Subject Code : MSM-510-18

M.Code : 77880

Date of Examination : 18-07-22

Time : 3 Hrs. **Max. Marks : 70**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of FIVE questions carrying TWO marks each.**
2. **SECTION - B & C have THREE questions each.**
3. **Attempt any FOUR questions from SECTION B & C carrying FIFTEEN marks each.**
4. **Select atleast TWO questions from SECTION - B & C each.**

SECTION-A

1. Write short notes on :

   a) State properties of Galerkin approximations.

   b) Explain iso-parametric elements.

   c) Explain Conjugate gradient.

   d) Define Hermite families of elements.

   e) State Lax Equivalence theorem.

SECTION-B

2. Solve the following set of linear equations using Successive over Relaxation method with relaxation parameter w = 1.1.

   $4x - y - z = 99.875,\ 2x - 4y + t = -99.6875,\ x - 4z + t = 0.3125,\ y + z - 2t = 0.25$

3. Solve the following system of linear equation using Jacobi iterative procedure $3x - y - z = 3$, $2x + 4y + z = 7$, $x - y + 4z = 4$. Consider the initial approximation, $x^{(0)} = 0$, $y^{(0)} = 0$, $z^{(0)} = 0$. Apply Jacobi method till the last two consecutive iterations have difference less than 0.0005.

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4. a) Discuss implicit method for hyperbolic partial differential equations.

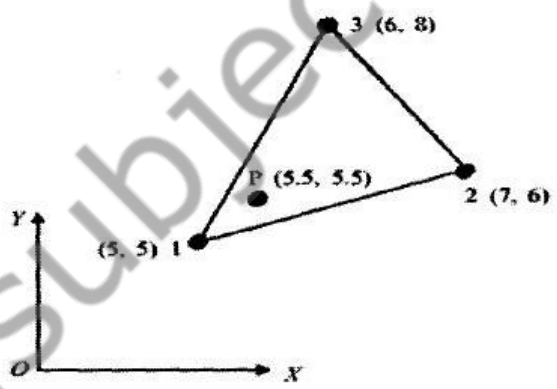
b) Given the following initial - boundary value problem $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$; $0 \le x \le 0.5$ $u(x, 0) = \cos(\pi x)$ $u(0, t) = 1$ and $u(0.5, t) = 0$. Compute the values of $u(x, t)$ up to $t = 0.02$ with $\Delta x = 0.1$ and $\Delta t = 0.005$. Use Explicit scheme.

SECTION-C

5. Solve the boundary value problem using Galerkin method $\frac{d^2y}{dx^2} = 3x\frac{dy}{dx} - 6y = 0$, $0 < x < 1$. Boundary conditions are: $y(0) = 1$. $y'(1) = 0.1$. Find $y(0.2)$ and compare with exact solution.

6. Solve the boundary value problem $y''' - y + x = 0 (0 \le x \le 1)$, $y(0) = y(1) = 0$ by Rayleigh - Ritz method.

7. For the three noded triangular element shown in below fig., Calculate the temperature at point P, given the nodal temperature as $T_1 = 100°C$, $T_2 = 200°C$, $T_3 = 300°C$



NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC case against the Student.

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