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

Total No. of Questions : 07

M.Sc. (Mathematics) (2017 Batch) (Sem.–4)

ADVANCED NUMERICAL METHODS

Subject Code : MSM-508

M.Code : 75976

Time : 3 Hrs. Max. Marks : 80

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of EIGHT questions carrying TWO marks each.**
2. **SECTION - B & C have THREE questions in each section carrying SIXTEEN marks each.**
3. **Select atleast TWO questions from SECTION - B & C EACH.**

SECTION-A

l. Explain briefly :

a) Lax equivalence theorem.

b) SOR method for linear system of equations.

c) BiCG stability methods.

d) Classify the following equation as elliptic, parabolic or hyperbolic :

$$\frac{\partial^2 z}{\partial x^2} = \frac{\partial^2 z}{\partial y^2}.$$

e) Properties of galerkin approximations.

f) Isoparametric elements.

g) Hermite families of elements.

h) Petrov-Galerkin method.

SECTION-B

2. Solve the following by Gauss Seidal method :

$$3x_1 - 2x_2 + 8x_3 = -4$$

$$5x_1 + x_2 - x_3 = 12$$

$$x_1 + 6x_2 + 2x_3 = 6$$

3. $\frac{\partial^2 u}{\partial x^2} - 3\frac{\partial^2 u}{\partial x \partial y} + 2\frac{\partial^2 u}{\partial y^2} = 0 : u(x, 0) = -x^2 ; u_y(x, 0) = 0$

   a) Classify the partial differential equation.

   b) Find the value of u at $(x, y) = (0, 1)$

4. Find the complete solution to $6\frac{\partial^2 u}{\partial x^2} - 5\frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = 14,$

   $u(x, 0) = 2x + 1$

   $u_y(x, 0) = 4 - 6x$

SECTION-C

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

6. Use Galerkin's method to solve the boundary value problem $y'' = 3x + 4y$; $y(0) = 0$, $y(1) = 1$

7. Establish an algorithm to solve fourth order problems using Finite element method.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.