

**B.Tech. 4th Semester (AUE) F-Scheme Examination,  
May-2018**

**ENGINEERING ANALYSIS & NUMERICAL  
METHODS**

**Paper-AUE-202-F**

Time allowed : 3 hours ] [ Maximum marks : 100

*Note: Question No. 1 is compulsory. Attempt total five questions with selecting one question from each section. All questions carry equal marks.*

1. (a) What is a divided difference table ? How is it useful ?
- (b) Define forward differences and backward differences.
- (c) What are direct methods and iterative method to Solve the system of linear equations ?
- (d) What are the limitations of Taylor's series method for solving ordinary differential equations ?

- (c) Define Jacobi's iteration method of linear equation.
- (f) How are the partial differential equations classified ? Give an example for each type.
- (g) Using Euler's method, find approximate value of y when x = 1 of  $\frac{dy}{dx} = x + y, y(0) = 1$  (take h = 0.2)
- (h) State Trapezoidal Rule.

**Section-A**

2. (a) Solve the equations :
 
$$10x - 2y - 3z = 205;$$

$$-2x + 10y - 2z = 154;$$

$$-2x - y + 10z = 120$$
 by using iterative method.

(b) Solve the equations :

$$3x + 2y + 7z = 4$$

$$2x + 3y + z = 5$$

$$3x + 4y + z = 7$$

by Gauss Jordan method.

3. (a) Determine the largest eigen value and the corresponding eigen vector of the matrix.

$$A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$$

(b) Using Jacobi's Method, find all the eigen value and the eigen vector of the matrix.

$$A = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 5 \end{bmatrix}$$

Section-B

4. (a) Given that

$$x: \quad 150 \quad 152 \quad 154 \quad 156$$

$$y = \sqrt{x}: \quad 12.247 \quad 12.329 \quad 12.410 \quad 12.490$$

Evaluate  $\sqrt{155}$  using Lagrange's interpolation formula.

(b) Solve the equation  $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$  subject to the conditions  $u(x, 0) = \sin \pi x, 0 \leq x \leq 1;$   
 $u(0, t) = u(1, t) = 0,$  using (a) Schmidt Method. Carryout computations for two levels, taking  $h = \frac{1}{3}, k = 1/36.$

5. (a) Find the cubic polynomial which takes the following values :

$$x: \quad 0 \quad 1 \quad 2 \quad 3$$

$$f(x): \quad 1 \quad 2 \quad 1 \quad 10$$

Hence or otherwise evaluate  $f(4).$

- (b) Use Stirling's formula to evaluate  $f$  (1.22), given

$x$ : 1.0    1.1    1.2    1.3    1.4

$f(x)$ : 0.841   0.891   0.932   0.963   0.985

### Section-C

6. (a) Find the first and second derivatives of  $f(x)$  at 1.5 if

$x$ : 1.5    2.0    2.5    3.0    3.5    4.0

$f(x)$ : 3.375   7.000   13.625   24.000   38.875   59.000

- (b) Evaluate  $\int_0^1 \frac{dx}{1+x^2}$  using

(i) Trapezoidal rule taking  $h = \frac{1}{4}$

(ii) Simpson's rule taking  $h = \frac{1}{6}$

7. (a) Find  $I = \int_0^1 (1+x^2) dx$ , by Gauss formula.

24219

[P.T.O.]

- (b) Using trapezoidal rule to evaluate the integral

$$\int_1^2 \int_1^2 \frac{dx dy}{x+y},$$

taking four sub-intervals.

### Section-D

8. (a) Using modified Euler's method, find  $y$  for  $x = 0.1$

and 0.2 Given that  $\frac{dy}{dx} = xy + y^2$ ,  $y(0) = 1$ .

- (b) Using modified Euler's method, obtain

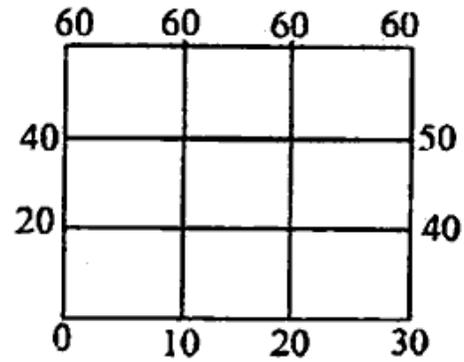
a solution of the equation  $\frac{dy}{dx} = x + |\sqrt{y}|$ , with initial conditions  $y = 1$  at  $x = 0$ , for the range  $0 \leq x \leq 0.6$  in steps of 0.2.

9. Solve the elliptic equation

$$u_{xx} + u_{yy} = 0$$

for the following square mesh with boundary values as shown -

24219



<http://haryanapapers.com>

Whatsapp @ 9300930012

Your old paper & get 10/-

पुराने पेपर्स भेजे और 10 रुपये पायें,

Paytm or Google Pay से