17. Use Picard's method to approximate the value of y when $x = 0.1, 0.2, 0.3, 0.4$ and 0.5, given that $y = 1$ at $x = 0$ and $y' = 1 + xy$, correct to three decimal places.

18. Use Runge Kutta method of fourth order, solve for $y(0.1), y(0.2)$ and $y(0.3)$ given that $y' = xy + y^2, y(0) = 1$.

19. Solve $u_{xx} + u_{yy} = 0$ in $0 \le x \le 4; 0 \le y \le 4$, given that $u(0, y) = 0; u(4, y) = 8 + 2y; u(x, 0) = \frac{x^2}{2}$ and $u(x, 4) = x^2$. Take $h = k = 1$ and obtain the result correct to one decimal.

20. Solve the equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square mesh with sides $x = 0, y = 0, x = 3, y = 3$ with $u = 0$ on the boundary and mesh length = 1.

S.No. 363 **17PMAE01**

(For the candidates admitted from 2017 – 2018 onwards)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2017.

First Semester

NUMERICAL ANALYSIS

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. State an initial value problem.

2. Define Predictor-Corrector method.

3. Write the Euler formula.

4. Write the Picard formula for approximation.

5. What is the slope of middle point of interval (x_0, y_0)?

6. Define the Runge's Kutta method.

7. Define the step by step method for power series solution.

8. What is the condition for the PDE $Au_{xx} + Bu_{xy} + Cu_{yy} + Du_x + Eu_y + Fu = 0$ to be elliptic.

9. Write the Poisson equation.

10. What is recurrence equation?

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Find the solution to the differential equation $y' = (1+x)xy^2$ subject to $y(0) = 1$ by taking five terms in Maclaurin's series for $x = 0(0.1)0.4$.

Or

(b) Derive the equation of Predictor-Corrector of y_{i+1}.

12. (a) Use Picards method to find the approximate the value of y when $x = 0.1$ given that $y = 1$ when $x = 0$ and $\frac{dy}{dx} = \frac{y-x}{y+x}$.

Or

(b) Solve $\frac{dy}{dx} = 1 - y, y(0) = 0$ in the range $0 \le x \le 0.3$ by using Euler's method.

13. (a) Apply Runge's method to find an approximate value of y when $x = 0.2$, given that $y' = x + y$ and $y(0) = 1$.

Or

(b) Derive the formula for Runge Kutta method of third order.

14. (a) Find the forward difference approximation to $u_x(x_0, y_0)$.

Or

(b) Derive the diagonal five point formula.

15. (a) Find the solution to $u_t = u_{xx}$ subject to $u(x, 0) = \sin \pi x, 0 \le x \le 1, u(o, t) = u(l, t) = 0$ by using Schmidt method.

Or

(b) Derive the Bender Schmidt recurrence equation.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Given $\frac{dy}{dx} = 1/x + y, y(0) = 2$, $y(0.2) = 2.0933, y(0.4) = 2.1755,$ $y(0.6) = 2.2493$ find $y(0.8)$ using Milne's method.