

Code No. 2020 / E

**FACULTIES OF ARTS AND SCIENCE****B.A. / B.Sc. III – Year Examination, March / April 2016****Subject : MATHEMATICS****Paper – IV (a)****Numerical Analysis****Time : 3 hours****Max. Marks : 100**

**Note : Answer Six questions from Part-A & Four questions from Part-B.  
Choosing atleast one from each Unit. Each question in Part-A carries  
6 marks and in Part-B carries 16 marks.**

**Part – A (6 X 6 = 36 Marks)****Unit - I**

1 If  $u = 5xy^2 / z^3$  then find maximum relative error in  $u$  given that  $\Delta x = \Delta y = \Delta z = 0.001$ ,  
 $x = y = z = 1$ .

2 Explain bisection method of finding a real root of  $f(x) = 0$ .

**Unit - II**

3 Derive Lagrange's formula.

4 Define the operators  $\Delta, \nabla, E$  and  $\delta$  show that

$$\text{i) } \Delta = \nabla E = \delta E^{1/2} \quad \text{ii) } \mu = \sqrt{1 + \frac{1}{4} \delta^2}$$

**Unit - III**

5 Explain the method of fitting a straight line to the given data using the principle of least squares.

6 Evaluate  $\int_{-2}^2 \frac{t}{5+2t} dt$  using Trapezoidal rule with 8 strips.

**Unit - IV**

7 Apply Euler's method to compute  $y(0.4)$ ,  $y(0.6)$  given that  $\frac{dy}{dx} = x + y$ ,  $y(0) = 0$  with  
 $h=0.2$ .

8 Solve the following system of equation using Jacobi's iterative method  
 $10x + 2y + z = 9$ ,  $2x + 20y - 2z = -44$ ,  $-2x + 3y + 10z = 22$ .

**Part – B (4 X 16 = 64 Marks)****Unit - I**

9 a) Find the real root of  $x^3 - x^2 - 1 = 0$  upto three decimal places using bisection method.

b) Find a double root of  $x^3 - 3x^2 - 4 = 0$  by generalized Newton's method.

..2

- 10 a) Using Newton Raphson method find a root of  $x^4 - x - 10 = 0$ .  
b) Calculate the value of  $\sqrt{102} - \sqrt{101}$  correct to four decimal places.

**Unit - II**

- 11 a) Find the cubic polynomial which takes the following values.  
 $y(0) = 1, y(1) = 0, y(2) = 1, y(3) = 10$ , hence obtain  $y(4)$ .  
b) Prove that  $\Delta^n u_x = u_{x+n} - {}^nC_1 u_{x+n-1} + {}^nC_2 u_{x+n-2} + \dots + (-1)^n u_x$ .
- 12 a) Derive Newton's forward difference interpolation formula.  
b) Using Newton's forward difference formula, find the sum  $S_n = 1^3 + 2^3 + 3^3 + \dots + n^3$ .

**Unit - III**

- 13 a) Derive Simpsons 1/3 rule and find error in it.  
b) Find the value of  $\int_3^7 x^2 \log x \, dx$  by taking 8 strips using Boole's rule.
- 14 a) Using Trapezoidal rule find the value of  $\int_0^{\pi/2} \sqrt{\cos \theta} \, d\theta$  by dividing interval into 6 parts.  
b) Fit a straight line to the following data :

|   |      |     |     |     |     |    |
|---|------|-----|-----|-----|-----|----|
| x | 1    | 2   | 3   | 4   | 5   | 6  |
| y | 1200 | 900 | 600 | 200 | 110 | 50 |

**Unit - IV**

- 15 a) Solve the following systems of equations using Gauss elimination method  
 $2x + y + z = 10, 3x + 2y + 3z = 18, x + 4y + 9z = 16$ .  
b) Find the value of  $y$  for  $x = 0.1$  by Picard's method given that  $\frac{dy}{dx} = \frac{y-x}{y+x}$ ,  
 $y(0)=1$ .
- 16 a) Use Runge-Kutta's method of fourth order to compute  $y(0.1), y(0.2)$  given  
 $\frac{dy}{dx} = x + y, y(0) = 1$ .  
b) Use Taylor's series method to find  $y(0.1)$  correct to four decimal places if  $y(x)$  satisfies  $y' = x - y^2, y(0) = 1$ .

\*\*\*\*\*