

Roll No. ....

(01/22-II)

5241

B. A./B.Sc. EXAMINATION

(Fifth Semester)

MATHEMATICS

BM-353

Numerical Analysis

Time : Three Hours

Maxi. Marks :  $\begin{cases} \text{B.Sc. : 30} \\ \text{B.A. : 20} \end{cases}$

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. Marks for B. A. are in bracket.

(Compulsory Question)

1. (a) Prove that  $E = 1 + \Delta$  and  $\nabla = 1 - E^{-1}$ .

1½(1)

- (b) Define Poisson Distribution.  $1\frac{1}{2}(1)$
- (c) State Simpson's one-third Quadrature formula.  $1\frac{1}{2}(1)$
- (d) Find Binomial distribution whose mean is 3 and variance is 2. Also find  $P(X = 2)$ .  $1\frac{1}{2}(1)$

### Section I

2. (a) Construct the difference table and find sixth and seventh term of series 0, 4, 16, 42, 88.  $3(2)$
- (b) Using Newton Forward interpolation formula find  $f(5)$  using table :  $3(2)$

$x$	4	6	8	10
$f(x)$	1	3	8	16

3. Using Newton's Divided Difference formula, find  $f(x)$  as a polynomial in powers of  $(x - 6)$  :  $6(4)$

$x$	$f(x)$
-1	-11
0	1

2	1
3	1
7	141
10	561

### Section II

4. (a) Derive Bessel formula for central difference interpolation. 3(2)
- (b) Find  $y_9$ , given that  $y_0 = 14$ ,  $y_4 = 24$ ,  $y_8 = 32$ ,  $y_{12} = 35$ ,  $y_{16} = 40$ . 3(2)
5. (a) If  $X$  is a binomial variate with mean 4 and variance 2, find  $P(|X - 4| \leq 2)$ . 3(2)
- (b) Suppose 8% of people are left handed. Using Poisson Distribution find probability of two or more of a sample of 25 are left handed. 3(2)

### Section III

6. Find the first derivative of function  $y = f(x)$  at point  $x = 10$  using table : 6(4)

$x$	$f(x)$
3	-13
5	23

11

899

27

17315

34

35606

7. Transform the matrix  $A = \begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & 2 \\ -1 & 2 & 1 \end{bmatrix}$  to

Tridiagonal form by Householder's method.

6(4)

#### Section IV

8. (a) Using Trapezoidal rule, evaluate  $\int_0^1 x^3 dx$

taking 5 subintervals.

3(2)

(b) Given  $\frac{dy}{dx} = \frac{y-x}{y+x}$  with initial condition

$y = 1$  at  $x = 0$ . Find  $y$  for  $x = 0.1$  by

Euler's method.

3(2)

9. (a) Evaluate  $\int_0^3 \frac{1}{1+x^2} dx$  using Simpson

$\frac{1}{3}$ rd rule taking  $h = \frac{1}{2}$ . 3(2)

(b) Using Picard method, find third approximation of the following equation :

$$\frac{dy}{dx} = y - 1, y(0) = 2. \quad 3(2)$$