

Roll No. ....

Total Pages : 04

**GSQ/D-20**

**1032**

NUMERICAL ANALYSIS

BM-353

Time : Three Hours]

[Maximum Marks : 20

**Note :** Attempt *Five* questions in all, selecting *one* question from each Section. Q. No. **1** is compulsory.

**(Compulsory Question)**

1. (a) State Newton-Gregory formula for forward interpolation.
- (b) What is Extrapolation ? Explain with example.
- (c) Write Simpson's 3/8 quadrature formula.
- (d) Prove that  $\nabla = \Delta E^{-1}$ . **1,1,1,1**

**Section I**

2. (a) Given that :

$x$	: 1	2	3	4	5
$y$	: 2	5	10	17	26

Find the value of  $\nabla^2 y_5$ , using various properties.

**(5)L-**

(b) Given :

$x$	:	1	2	3	4	5	6	7	8
$y$	:	1	8	27	64	125	216	343	512

Find the value of  $f(7.5)$ . **2,2**

3. (a) By means of Lagrange's formula, prove that  $u_1 = u_3 - 0.3(u_5 - u_{-3}) + 0.2(u_{-3} - u_{-5})$ .
- (b) Find the polynomial of the lowest possible degree which assumes the value 3, 12, 15, -21, when  $x$  has the value 3, 2, 1, -1 respectively. **2,2**

## Section II

4. (a) Use Gauss' forward formula to find the value of  $y$ , when  $x = 3.75$  from the following table :
- |     |   |        |        |        |        |        |        |        |
|-----|---|--------|--------|--------|--------|--------|--------|--------|
| $x$ | : | 2.5    | 3.0    | 3.5    | 3.5    | 4.0    | 4.5    | 5.0    |
| $y$ | : | 24.145 | 22.043 | 22.043 | 20.225 | 18.644 | 17.262 | 16.047 |
- (b) Apply Bessel's formula to obtain  $y_{25}$ , given  $y_{20} = 2854$ ,  $y_{24} = 3162$ ;  $y_{28} = 3544$ ,  $y_{32} = 3902$ . **2,2**
5. (a) Find the probability distribution of the number of heads in three tosses of a coin.
- (b) A die is thrown 6 times. Getting an odd number is a success. What is the probability of getting (i) 5 successes (ii) at least 5 successes. **2,2**

### Section III

6. Find the first and second derivatives of the function  $y = f(x)$  tabulated below at the point  $x = 1.1$  :

$x$	:	1	1.2	1.4	1.6	1.8	2.00
$f(y)$	:	0.00	0.1280	0.5440	1.2960	2.4320	4.00

4

7. Using power method, find the largest eigen value and the corresponding eigen vector of the matrix

$$A = \begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 6 \end{bmatrix} .$$

4

### Section III

8. (a) Evaluate  $\int_0^1 \frac{1}{1+x^2} dx$  by Trapezoidal rule.

- (b) The velocity  $V$  (km/min) of a bike which starts from rest is given at fixed intervals of time (min.) as follows :

$x$	:	0	2	4	6	8	10	12	14	16	18	20
$y$	:	0	10	18	25	29	32	20	11	5	2	0

Estimate approximately by the distance covered in 20 minutes.

2,2

9. (a) Apply Euler's method to solve  $\frac{dy}{dx} = x + y$ ,  
 $y(0) = 0$ , choosing the step length = 0.2, find  $y(1.4)$ .
- (b) Given  $\frac{dy}{dx} = 1 + y^2$ ; where  $y = 0$ , when  $x = 0$  find  
 $y(0.2)$  by R-K method.