

**GSQ/D-21****1064****MATHS.****(Numerical Analysis)****Paper–BM-353**

Time : Three Hours]

[Maximum Marks : 30

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

**Compulsory Question**

1. (a) Prove  $\Delta \cos (cx + d) = 2 \sin \frac{ch}{2} \cos \left( cx + d + \frac{ch + \pi}{2} \right)$ .
- (b) Show that  $\Delta^2 x^2$  is independent of  $x, y, z$ .
- (c) If X is Poisson variate such that probability  $P(X = r)$  for  $r = 0$  is  $e^{-2}$ . Find  $P(X = 1)$  and  $P(X = 2)$ .
- (d) Write formula for  $\frac{dy}{dx}$  using Newton's Backward formula. 4

**SECTION-I**

2. (a) The population of town is as follows :

Year	1961	1971	1981	1991	2001	2011
Population (in lacs)	20	24	29	36	46	51

Estimate the increase in population during the period 1995 to 2001. 3

- (b) Given that  $y_{1.50} = 0.4332$ ,  $y_{1.55} = 0.4394$ ,  $y_{1.60} = 0.4452$ ,  $y_{1.65} = 0.4505$ ,  $y_{1.70} = 0.4554$ . Find the values of  $y_{1.51}$ ,  $y_{1.52}$ ,  $y_{1.53}$  and  $y_{1.54}$ . 3½

3. (a) Using Newton's divided formula, find  $f(x)$  from the following data :

$x$	0	1	2	4	5	6
$f(x)$	1	14	15	5	6	19

3

- (b) Apply Hermite's formula to estimate the value of  $\log 3.2$  from the following data :

$x$	$f(x) = \log x$	$f'(x) = \frac{1}{x}$
3.0	1.0986	0.3333
3.5	1.2528	0.2857
4.0	1.3863	0.2500

3½

### SECTION-II

4. (a) Using Sterling formula to find  $f(35)$ , given  $f(20) = 512$ ,  $f(30) = 439$ ,  $f(40) = 346$  and  $f(50) = 243$ . 3

- (b) Apply Gauss forward formula to find the value of  $y_9$ , given that  $y_0 = 14$ ,  $y_4 = 24$ ,  $y_8 = 32$ ,  $y_{12} = 35$ ,  $y_{16} = 40$ . 3½

5. (a) The probability that a bomb dropped from a plane hits a target is 0.4. Two bombs can destroy a bridge. If all 6 bombs are dropped, find the probability that the bridge will be destroyed. 3

- (b) Suppose a book of 585 pages contains 43 pages with misprints. If these pages are randomly distributed throughout the book; what is the probability that 10 pages, selected at random will be free from pages with misprints. [ $e^{-0.735} = 0.4795$ ]. 3½

### SECTION-III

6. (a) The distance (s) covered by a car in given time (t) is given in the following table :

Time (minutes) :    12   14    18   20    24

Distance (km) :    14   18    23   25    34

Find acceleration of the car at  $t = 17$  minutes. 3

- (b) Using given's method, reduce the following matrix to the diagonal form :

$$\begin{bmatrix} 2 & 1 & 3 \\ 1 & 4 & 2 \\ 3 & 2 & 3 \end{bmatrix}. \quad 3\frac{1}{2}$$

7. Using House-Holder's method, reduce the matrix  $\begin{bmatrix} 1 & 4 & 3 \\ 4 & 1 & 2 \\ 3 & 2 & 1 \end{bmatrix}$  to tri-diagonal form. 6½

### SECTION-IV

8. (a) Evaluate  $\int_0^{\pi/2} e^{\sin x} dx$  correct to four decimal places by dividing the range into three equal parts. 3

(b) Use Euler's modified method to get  $\frac{dy}{dx} = \log(x + y)$  for  $y$  at  $x = 0.2$ . Given  $y = 1$  for  $x = 0$ . 3½

9. (a) Find by Runge-Kutta method an approximate value of  $y$  for  $x = 0.8$  given that  $y = 0.41$  when  $x = 0.4$  and

$$\frac{dy}{dx} = \sqrt{x + y}. \quad 3$$

(b) Use Picard's method upto third approximation to solve

the solution  $\frac{dy}{dx} - 2xy = -1, y(0) = 0.$  3½

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