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GSQ/D-21 **1038**

MATHEMATICS

(Numerical Analysis)

Paper–POM-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's Backward Interpolation formula.

(b) Find Binomial distribution where mean is 3 and variance is 2.

(c) Define Simpson's $\frac{1}{3}$ rd rule of integration.

(d) Evaluate $\Delta(x^2 + \sin x)$. 4

SECTION–I

2. (a) Given

$\sin 45° = 0.7071$; $\sin 50° = 0.7660$

$\sin 55° = 0.8192$; $\sin 60° = 0.8660$

Find $\sin 52°$.

(b) Using Newton's divided difference formulas, find the function u_x in powers of $x - 1$, given that $u_0 = 8$, $u_1 = 11$, $u_4 = 68$, $u_5 = 123$. (2,2)

3. (a) By means of Langrange's formula prove that

$$y_0 = \frac{1}{2}[y_1 + y_{-1}] - \frac{1}{8}\left[\frac{1}{2}(y_3 - y_1) - \frac{1}{2}(y_{-1} - y_{-3})\right]$$

(b) Apply Hermite's formula to interpolate for sin (1.05) from the following data :

x	sin x	cos x
1.00	0.84147	0.54030
1.10	0.89121	0.45360

2,2

SECTION–II

4. (a) Use Sterling formula to find the value of $\sqrt{22.2}$ given that

$\sqrt{20} = 4.472$; $\sqrt{21} = 4.583$; $\sqrt{22} = 4.690$

$\sqrt{23} = 4.796$; $\sqrt{24} = 4.899$.

(b) Given $y_{20} = 24$, $y_{24} = 32$, $y_{28} = 35$, $y_{32} = 40$ find y_{25} by Bessel's formula. 2,2

5. (a) Two unbiased dice are thrown together at random. What is expected value of sum of the numbers shown by the two dice ?

(b) Two cards are drawn simultaneously from a pack of 52 cards without replacement. Find the probability distribution of kings. 2,2

SECTION–III

6. Find the maximum value of $f(x)$ using the following tables:

x	–1	1	2	3
$f(x)$	7	5	19	51

4

7. Using Jacobi's method, find all the eigen values and the eigen vectors of matrix

$$A = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}.$$

4

SECTION–IV

8. (a) Evaluate $\int_0^1 \frac{1}{1+x^2}\,dx$ by trapezoidal rule taking $h = \frac{1}{4}$.

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

9. Use the Runge-Kutta method to solve $10\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$ for the interval $0 < x \leq 0.4$ with $h = 0.1$. 4