

Con. 6444-13.

GS-6924

(3 Hours)

[Total Marks : 100

- N.B. :** (1) Question No. 1 is compulsory.  
 (2) Attempt any **four** from remaining six questions.  
 (3) **Figures** to the **right** indicate **full** marks.  
 (4) Assume the **suitable data** if needed with **justification**.

1. (a) A fair coin is tossed till head appears. What is the expectation of the number of tosses required. 5  
 (b) Solve using Bisection method. 5  
 $x - \cos x = 0$  find the positive root.  
 (c) Solve graphically the following L.P.P. 5  
 Maximize,  $z = x - 2y$   
 Subject to,  $-x + y \leq 1$   
 $6x + 4y \geq 24$   
 $0 \leq x \leq 5, 2 \leq y \leq 4$   
 (d) The mean value of a random sample of 60 items was found to be 145, with standard deviation of 40. Find the 95% confidence limits for the population mean. 5

2. (a) If p.d.f. of a random variable is given by,  $f(x) = x \quad 0 \leq x \leq 1$  6  
 $= 2 - x \quad 1 \leq x \leq 2$   
 $= 0 \quad \text{otherwise}$

Find the m.g.f. and hence find mean and variance.

- (b) If  $x_1$  and  $y_2$  are independent normal variates with mean 30 and 25 and variance 16 and 12 respectively and  $y = 3x_1 - x_2$ . Find  $P(60 \leq y \leq 80)$  6

- (c) Evaluate  $\int_0^1 \frac{dx}{1+x}$  using 8

- (i) Trapezoidal rule (ii) Simpson's  $\frac{1}{3}$ rd rule (iii) Simpson's  $\frac{3}{8}$ th rule.

3. (a) Test significance of difference between the means of samples drawn from two normal populations with the following data :— 6

	Size	mean	s.d.
Sample I	100	61	4
Sample II	200	63	6

- (b) If  $x = au + b, y = cu + d$   $a, b, c, d$  are constants then prove  $r_{xy} = r_{uv}$  6  
 Where  $r_{xy}$  - coefficient of correlation between  $x$  and  $y$ .

- (c) Fit a second degree curve for the following data :— 8

x	1	2	3	4	5
y	1250	1400	1650	1950	2300

[TURN OVER

Con. 6444-GS-6924-13.

4. (a) Solve using Gauss-seidel method. 6

$$10x + y + z = 12; \quad 2x + 10y + z = 13; \quad 2x + 2y + 10z = 14$$

(b) According to theory of proportion of commodity in the four classes A, B, C, D should be 9 : 2 : 4 : 1. In a survey of 1600 items of this commodity the numbers in four classes were 882, 432, 168 and 118. Does the survey support the theory? 6

(c) Find the coefficient of corelation for the following data :— 8

<b>x</b>	2	4	5	6	8	11
<b>y</b>	18	12	10	8	7	5

5. (a) Let x be a random variable with p.d.f. 6

<b>x</b>	-3	6	9
<b>P(x)</b>	1/6	1/2	1/3

Find mean, variance and also find  $E(2x + 1)^2$

(b) Explain : 6

- (i) Null hypothesis
- (ii) Alternate hypothesis
- (iii) Critical region
- (iv) Level of significance
- (v) Types of errors
- (vi) One-tailed and two-tailed tests.

(c) Find  $f(8)$  from the data :— 8

<b>x</b>	5	7	11	13	17
<b>f(x)</b>	150	392	1452	2366	5202

6. (a) Solve : using Gauss-Jordan method  $2x + y + 4z = 16; \quad 3x + 2y + z = 10; \quad x + 3y + 3z = 16.$  6

(b) How many tosses of a coin are needed so that the probability of getting at least one head is 87.5%? 6

(c) Solve : 8

Maximize :  $z = 4x_1 + x_2 + 3x_3 + 5x_4$   
 Subject to :  $4x_1 - 6x_2 - 5x_3 - x_4 \leq 2$   
 $-3x_1 - 2x_2 + 4x_3 + x_4 \leq 10$   
 $-8x_1 - 3x_2 + 3x_3 + 2x_4 \leq 20$   
 $x_1, x_2, x_3, x_4 \geq 0$

7. (a) Find mean and variance of Binomial Distribution. 6

(b) Two batches of 12 animals are taken for test of inoculation. One batch was inoculated and other was not from the data can it be regarded as effective against the disease? 6

	<b>Dead</b>	<b>Survived</b>	<b>Total</b>
<b>Inoculated</b>	2	10	12
<b>Non-Inoculated</b>	8	4	12
<b>Total</b>	<b>10</b>	<b>14</b>	<b>24</b>

(c) Show that  $R = r$  for the following data :— 8

<b>x</b>	60	62	64	66	68	70	72	74
<b>y</b>	92	83	101	110	128	119	137	146