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3 (Sem-4) STS M3 Pr

2017

## STATISTICS

(Major Practical)

Paper : 4.3

Full Marks – 50

Time – Three hours

The figures in the margin indicate full marks for the questions.

### FIRST HALF

Answer any *four* questions.

1. Find the characteristic roots and characteristic vectors of the matrix : 8

$$A = \begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$$

[Turn over

2. (a) Use graphical method to solve the following linear programming problem. 4

$$\text{Minimize } Z = 2x_1 + 3x_2$$

Subject to the constraint

$$-x_1 + 2x_2 \leq 4$$

$$x_1 + x_2 \leq 6 \text{ and}$$

$$x_1 + 3x_2 \leq 9 \text{ and}$$

$$x_1, x_2 \geq 0$$

- (b) A person working at a call centre receives three types of queries 1, 2, 3. Assume that the queries would be represented by a Markov chain with the following transition probability matrix : 4

Current query	Next query		
	1	2	3
1	0.5	0.3	0.2
2	0.4	0.2	0.4
3	0.3	0.3	0.4

Given that the initial state probability distribution  $P^{(0)} = (0.3, 0.3, 0.4)$ .

Find  $P^{(2)}$

3. Solve the following linear programming problem by Simplex Method : 8

$$\text{Maximize } Z = 4x_1 + 10x_2$$

Subject to the constraint

$$2x_1 + x_2 \leq 50$$

$$2x_1 + 5x_2 \leq 100$$

$$2x_1 + 3x_2 \leq 90$$

$$x_1, x_2 \geq 0$$

4. (a) A dice is thrown 1000 times and of this 752 yielded either 1 or 4 or 6. Is this consistent with the hypothesis that the dice is unbiased ? 4

(b) Two populations have their means equal, but S.D. of one is twice the other. Show that :

(i) in the samples of size 2000 from each drawn under simple that of sampling conditions, the difference of means will, in all probability not exceed  $0.15\sigma$  where  $\sigma$  is smaller S.D.

(ii) What is the probability that the difference will exceed half this amount ? 4

5. (a) Verify Cayley-Hamilton theorem for the matrix : 4

$$A = \begin{pmatrix} 1 & 4 \\ 2 & 3 \end{pmatrix}$$

- (b) Let  $X_n$  be a random variable representing the weather of a particular place in a given day. Let  $X_n = 0$ , if the day is rainy and equal to 1, if the  $n$ th day is sunny. The one step transition probability matrix is given by :

$$\begin{matrix} & 0 & 1 \\ 0 & (0.6 & 0.4) \\ 1 & (0.2 & 0.8) \end{matrix}$$

If today's weather is given, what will be the weather of the day after tomorrow ? 4

6. Determine the initial basic feasible solution to the following transportation problem by Vogel's approximation method : 8

Origin	Destinations					Supply
	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	
O <sub>1</sub>	2	11	10	3	7	4
O <sub>2</sub>	1	4	7	2	1	8
O <sub>3</sub>	3	9	4	8	12	9
Demand	3	3	4	5	6	21

## SECOND HALF

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|-------------------------|----|
| 7. Practical Notebook.  | 4  |
| 8. Viva voce.           | 4  |
| 9. Internal Assessment. | 10 |

STATISTICS

(Major Practical)

Session - 43

Full Marks - 50

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FIRST HALF

Answer any four questions.

1. Find the characteristic roots and characteristic vectors of the matrix

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

