

B. C. A. (Sem. III) Examination
October/November – 2017
303 - Statistics & Optimization Technique

Time : 3 Hours]

[Total Marks : 70

Instructions : (1) Figure to the right indicate full marks.
(2) Be precise and to the point in your answer.

- 1 (a) Answer the following questions : 8
- (1) Define : Arithmetic Mean.
 - (2) Find the co-efficient of Range of 9,8,2,7,10,18,12 and 15.
 - (3) What is the standard deviation of first n natural numbers ?
 - (4) State the empirical relationship among mean, median and mode.
 - (5) Find mean of 3,5,6,10,2,8,11.
 - (6) Define : Standard deviation.
 - (7) What is the use of co-efficient of variation ?
 - (8) Which measure of central tendency is ideal ?
- (b) Attempt any two : 10
- (1) Find the mean from the following frequency distribution.

Age in years :	15 – 19	20 – 24	25 – 29	30 – 34	35 – 44	45 – 59	Total
No. of persons	37	81	43	24	9	6	200

- (2) Find the standard deviation for the following table :

x	5	15	25	35	45	55	65	75
f	3	7	9	23	15	8	6	4

- (3) Given the following results relating to two groups containing 20 and 30 observations, calculate the co-efficient of variation of all the 50 observations by combining both the groups :

	<i>Groups</i>	
	<i>I</i>	<i>II</i>
$\sum x$	45	55
$\sum x^2$	118	132

- 2 (a) Do as directed : 7

- (1) What is correlation ? List different types of correlation.
- (2) Define : Regression co-efficient of Y on X, regression co-efficient of X on Y.
- (3) Prove that the geometric mean of regression co-efficient is the correlation co-efficient.

- (b) Attempt any two : 10

- (1) Find the co-efficient of correlation for the following data :

<i>X</i>	65	63	67	64	68	62	70	66
<i>Y</i>	68	66	68	65	69	66	68	65

- (2) In a contest, two judges ranked seven candidates in order of their performance as in the following table :

<i>Candidate</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>
<i>Ranks by Judge - 1</i>	2	1	4	5	3	7	6
<i>Ranks by Judge - 2</i>	3	4	2	5	1	6	7

Calculate the rank correlation co-efficient.

- (3) The following result were obtained from records of age(x) and systolic blood pressure(y) of a group of 10 women :

	x	y
Mean	53	142
Variance	130	165
$\sum (x - \bar{x})(y - \bar{y})$	1220	

Find the appropriate regression equation and use it to estimate the blood pressure of a women whose age is 45.

- 3 (a) Answer the following : 8

- (1) Define : Slack variable, Surplus variable.
- (2) State the mathematical model of general linear programming problem.
- (3) Explain : Duality in LPP.
- (4) What is the full form of CPM and PERT.

- (b) Attempt any two : 10

- (1) Solve the following LPP using Graphical method.

$$\text{Maximize } Z = 3X_1 + 5X_2$$

Subject to constraints

$$X_1 + X_2 \leq 5, 2X_1 + X_2 \leq 8, X_1 + 2X_2 \leq 10$$

and $X_1, X_2 \geq 0$.

- (2) Solve the following LPP using simplex method.

$$\text{Max } Z = 6X_1 + 8X_2$$

Subject to constraints

$$5X_1 + 10X_2 \leq 60, 4X_1 + 4X_2 \leq 40 \text{ and } X_1, X_2 \geq 0.$$

- (3) Draw a network diagram for following information.

Activity	A	B	C	D	E	F	G	H	I	J	K
Predecessor activity	-	-	-	A, B, C	A, B, C	D	D, E	D, E	F	G	H

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(a) Answer the following :

(1) What is transportation problem ?
Give mathematical model of general transportation problem.

(2) How to convert maximization assignment problem into minimization ?

(3) What is degeneracy in transportation problem ? How to resolve it ?

(b) Attempt the following :

(1) Obtain an initial basic feasible solution for the following transportation problem using NWCM and LCM.

7

2

2

3

10
- | | <i>D1</i> | <i>D2</i> | <i>D3</i> | <i>D4</i> | <i>Supply</i> |
|---------------|-----------|-----------|-----------|-----------|---------------|
| <i>O1</i> | 5 | 1 | 3 | 4 | 300 |
| <i>O2</i> | 4 | 2 | 9 | 7 | 400 |
| <i>O3</i> | 8 | 7 | 6 | 2 | 500 |
| <i>Demand</i> | 250 | 350 | 400 | 200 | 1200 |
- (2) Assign salesman to different sales region such that total sales will be maximum.
- | | | Sales region | | | |
|----------|----------|--------------|-----------|------------|-----------|
| | | <i>I</i> | <i>II</i> | <i>III</i> | <i>IV</i> |
| Salesman | <i>A</i> | 10 | 22 | 12 | 14 |
| | <i>B</i> | 16 | 18 | 22 | 10 |
| | <i>C</i> | 24 | 20 | 12 | 18 |
| | <i>D</i> | 16 | 14 | 24 | 20 |