



MAN-003-001663 Seat No. _____

B. Sc. (Statistics) (Sem. VI) (CBCS) Examination

March / April - 2018

**S-602 : Statistical Quality Control &
Operations Research
(New Course)**

Faculty Code : 003

Subject Code : 001663

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

- Instructions :** (1) Q. No. 1 carries 20 marks.
(2) Q. No. 2 and Q. No. 3 carries 25 marks each.
(3) Students can carry their own scientific calculator.

1 Fill in the blanks : 20

- (1) Variation in the measurements of items produced under any system is _____
- (2) Model in which at least one decision variable is random is known as _____ model.
- (3) Whether the variability in the manufactured items is within tolerance limits or not can be ascertained through _____
- (4) The constraints may be in the form of _____
- (5) In control charts we establish _____ limits.
- (6) A _____ variable represents amounts by which solution values exceed a resource.
- (7) *R-chart* Uncover assignable cause's _____ samples.
- (8) In case of large samples _____ charts should preferable be used.
- (9) The variance of the fraction defective is obtained by the variance of _____ distribution.
- (10) In Big-M method, _____ basic feasible solution is obtained by assigning _____ value to the original value.
- (11) Sampling inspection reduces the risk of the _____
- (12) The decision about lot under sampling inspection is _____ types.

- (13) The _____ serves the same purpose for the transportation method all slack variables in the simplex method.
- (14) The probability of accepting a lot with fraction defectives p_t is known as _____
- (15) The per cent defectives in a lot below which only the lot is acceptable is known as _____
- (16) The percentage of maximum defective items finally accepted in a lot is known as _____
- (17) The _____ method provides an efficient method of finding the optimal solution without making a direct comparison of every solution.
- (18) For a salesman who has to visit n cities which _____ ways of his tour plan.
- (19) The inspection of 25 aircrafts revealed that there are 350 missing rivets in all. The appropriate control chart in this situation which can be prepared is _____
- (20) A factory produces 300 articles per day. After inspecting 3000 articles on 30 consecutive days, 270 articles were non-conforming to the specification. The upper control limit for p -chart is _____

- 2 (A) Give the answer : (Any **Three**) 6
- (1) Define acceptance sampling
 - (2) Compare R chart versus σ chart
 - (3) Obtain control limits of \bar{X} -chart and R -chart from the following information.

$$n = 4, m = 30, \sum \bar{X} = 59.82, \sum R = 17.22,$$

$$A_2 = 0.729, D_3 = 2.28$$
 - (4) Write the limitation of linear programming problem
 - (5) Define feasible solution
 - (6) Write the assumptions of LP problem
- (B) Give the answer : (Any **Three**) 9
- (1) Determine U -chart limits.
 - (2) Using graphical method to solve the following LP problem
 Maximize : $Z : 2x_1 + 4x_2$
 Subject to constraints : $2x_1 + 2x_2 \leq 48;$
 $x_1 + 3x_2 \leq 42; x_1 + x_2 \leq 21; x_1, x_2 \geq 0$
 - (3) Find the value of AOQ and ATI for single sampling plan (8000, 400, 1) when $p' = 0.5\%$.

$$\left[e^{-2} = 0.1353, e^{-4} = 0.0183 \right]$$

- (4) Explain general mathematical form of transportation problem.
- (5) Explain assignment problem with example.
- (6) Obtain a solution of following transportation problem by North-West corner method

	D_1	D_2	D_3	D_4	D_5	Supply
O_1	2	11	10	3	7	4
O_2	1	4	7	2	1	8
O_3	3	9	4	8	12	9
Requirement	3	3	4	5	6	21

(C) Give the answer : (Any **Two**) 10

- (1) Write the difference between variable charts and attribute charts
- (2) Short Note : Theory of Runs
- (3) Explain Average Total Inspection
- (4) A manufacturer produces two types of machines A and B. There are two sections in his factory. In section-I the assembling of parts is done and in section-II the finishing of the product is done. The following are certain information available :

Section	No. of workers required	
	A	B
I	5	2
II	3	3

In section-I not more than 180 workers can be employed and in section-II not more than 135 workers can be employed. The numbers of B type machines are to be manufactured, double or less than that of A type of machines. If each A type machine gives profit of Rs. 100 and B types machines gives profit of Rs. 150. Find how many machines of each type the manufacturer should produce so as to obtain maximum profit. Solve using graphical method.

- (5) Write the applications of Linear Programming

3 (A) Give the answer : (Any **Three**) 6

- (1) Define basic solution
- (2) Define charts for attributes
- (3) Explain consumer's risk
- (4) Define Linear programming
- (5) Define optimum feasible solution
- (6) Difference between p chart and np chart

(B) Give the answer : (Any **Three**)

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- (1) Obtain a solution of following transportation problem by least cost method :

	D_1	D_2	D_3	D_4	Supply
O_1	8	9	6	3	18
O_2	6	11	5	10	20
O_3	2	8	7	9	18
Requirement	15	16	12	13	56

- (2) Derivation OC function for double sampling plan
 (3) If in single sampling plan (200,15,1) and also $AQL = 0.015$ and $LTPD = 0.03$ then obtain producer's and consumer's risk.

$$\left[e^{-0.225} = 0.7945, e^{-0.45} = 0.6376 \right].$$

- (4) Explain transportation problem with example.
 (5) Explain mathematical form of LP problem.
 (6) Solve the assignment problem that the objective is to maximize the total cost

Presons	Work		
	A	B	C
I	20	8	4
II	16	5	6
III	10	2	3

(C) Give the answer : (Any **Two**)

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- (1) Discuss different assignable cause of variations
 (2) Derivation OC function for single sampling plan
 (3) Explain Average Sample Number
 (4) Obtain solution of the following LP problem by Simplex method

Maximize : $Z = 3x_1 + 4x_2$

Subject to constraints : (i) $2x_1 + 3x_2 \leq 16$

(ii) $2x_1 + x_2 \leq 8$; and (iii) $x_1, x_2 \geq 0$

- (5) Obtain a solution of following transportation problem by Vogel's method

	D_1	D_2	D_3	Supply
O_1	3	7	1	20
O_2	2	9	12	30
O_3	10	2	5	50
Requirement	35	15	50	100