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RY-003-1016052 Seat No. _____

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

March - 2019

Statistics : Paper - 602

(Statistics – Quality Control & Operation Research)

(New Course)

Faculty Code : 003

Subject Code : 1016052

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instruction : All questions are compulsory.

1 (A) Give the answer of following questions : **4**

(1) The variance of the fraction defective is obtained by the variance of _____ distribution.

(2) Variation in the measurements of items produced under any system is _____.

(3) 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 _____.

(4) The lower limit of $np-chart$ is _____.

(B) Write any **one** : **2**

(1) Based on 15 sub-groups of size 200 taken at intervals of 45 minutes from a manufacturing process the average fraction defective was found to be 0.068. Calculate the value of central line, upper and lower control limits.

(2) Define chart for attributes.

(C) Write any **one** : **3**

(1) Write the difference between variable charts and attribute charts.

(2) The number of defects noticed in 20 cloth pieces are given below : 1, 4, 3, 2, 5, 4, 6, 7, 2, 3, 2, 5, 7, 6, 4, 5, 2, 1, 3, 8
Decide whether the process is in a state of statistical control.

(D) Write any **one** : **5**

(1) Discuss different assignable causes of variations.

(2) Write Short note: Theory of Runs

2 (A) Give the answer of following questions : **4**

(1) The graph drawn for proportion defectives and average sample number is known as _____.

(2) The probability of accepting a lot with fraction defectives p_t is known as _____.

(3) Operating characteristic (OC) curve depicts the probability of _____ a lot of quality.

(4) The purpose of acceptance sampling is to determine whether to accept or reject the product. The whole procedure is called _____.

(B) Write any **one** : **2**

(1) Explain : (2000,50,1,100,4)

(2) Find the value of AOQ and ATI for single sampling plan (8000,400,1) when $p' = 0.005$
$\left[e^{-2} = 0.13534, e^{-4} = 0.01832\right]$

(C) Write any **one** : **3**

(1) Explain AQL and Consumer risk.

(2) For single sampling plan (1000,50,1) find producer's risk and consumer risk when AQL=0.04 and LTPD=0.08 $\left[e^{-2} = 0.13534, e^{-4} = 0.01832\right]$

(D) Write any **one** : **5**

(1) Explain ATI function.

(2) Derive AOQ function.

3 (A) Give the answer of following questions : **4**

(1) The Constrains may be in the form of _____.

(2) Linear programming is a technique which attempts to determine how best to allocate _____ in order achieve _____.

(3) A basic feasible solution is said to be _____ if the values of all basic variables are nonzero and positive.

(4) The _____ points of the convex set give the basic feasible solution to the linear programming.

(B) Write any **one** : **2**

(1) Define : Basic solution

(2) Define : Linear programming.

(C) Write any **one** : **3**

(1) Explain General Mathematical form of LPP.

(2) Solve the following LPP by Graphical method

Min. $Z = 2x_1 + 5x_2$

Subject to constrain :

(i) $x_1 + x_2 \geq 2$

(ii) $5x_1 + 10x_2 \geq 50$

(iii) $x_2 - x_1 \leq 2$

(iv) $0 \leq x_1 \leq 6$

(v) $0 \leq x_2 \leq 4$ and $x_1, x_2 \geq 0$

(D) Write any **one** : **5**

(1) 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 machines. If each A type machine gives profit Rs. 100 and B type machine gives profit of Rs. 150, find how many machines of each type manufacturer should produce so as to obtain maximum profit. Solve by graphical method.

(2) A person has two iron mines. The production capacities of the mines are different. The iron ore can be classified into good, mediocre and bad varieties after certain process. The owner has decided to supply 12 or more tons of good iron, 8 or more tons of mediocre iron and 24 or more tons of bad iron per week.

The daily expense of first mine is Rs. 2000 and that of second mine is Rs. 1600. The daily production of each type of iron is given below :

	Daily production		
Mine	*Good*	*Mediocre*	*Bad*
1	6	2	4
2	2	2	12

To meet the supply most economically find the number of days for which the production in mines should be carried out. Solve by graphical method.

4 (A) Give the answer of following questions : 4

(1) A _____ variable represents amounts by which solution values exceed a resource.

(2) Entries in the $c_j - z_j$ rows are known as _____ costs.

(3) In Big–M method, _____ basic feasible solution is obtained by assigning _____ value to the original value.

(4) _____ occurs when there is no finite solution in the LP problem.

(B) Write any **one** : 2

(1) Define: Surplus and Slack variable.

(2) Write the dual of the following problem

Min. $Z = 3x_1 - 2x_2 + 4x_3$

Subject to constrain :

(i) $3x_1 + 5x_2 + 4x_3 \geq 7$

(ii) $6x_1 + x_2 + 3x_3 \geq 4$

(iii) $7x_1 - 2x_2 - x_3 \leq 10$

(iv) $x_1 - 2x_2 + 5x_3 \geq 3$

(v) $4x_1 + 7x_2 - 2x_3 \geq 2$ and $x_1, x_2, x_3 \geq 0$

(C) Write any **one** : 3

(1) Write limitation of Simplex method.

(2) Solve the following LPP by simplex method

Min. $Z = 2x_1 + x_2$

Subject to constrain :

(i) $3x_1 + x_2 = 3$

(ii) $4x_1 + 3x_2 \geq 6$

(iii) $x_1 + 2x_2 \leq 4$ and $x_1, x_2 \geq 0$

(D) Write any **one** : **5**

(1) Solve the following LPP by simplex method

Max. $Z = 3x_1 + 5x_2 + 4x_3$

Subject to constrain :

(i) $2x_1 + 3x_2 \leq 8$

(ii) $2x_2 + 5x_3 \leq 10$

(iii) $3x_1 + 2x_2 + 4x_3 \leq 15$ and $x_1, x_2, x_3 \geq 0$

(2) Solve the following LPP by two phase simplex method

Min. $Z = x_1 + x_2$.

Subject to constrain :

(i) $2x_1 + x_2 \geq 4$

(ii) $x_1 + 7x_2 \geq 4$ and $x_1, x_2 \geq 0$

5 (A) Give the answer of following questions : **4**

(1) The solution to a transportation problem with *m–rows (supplies)* and *n–columns (destination)* is feasible if number of positive allocation are _____.

(2) The assignment problem requires that only _____ be assigned to _____.

(3) If there were *n* workers and *n* jobs there would be _____ solution.

(4) The _____ serves the same purpose for the transportation method all slack variables in the simplex method.

(B) Write any **one** : **2**

(1) Explain Assignment problem with example.

(2) Solve the following transportation problem by North-West corner method and find Total Cost.

	D_1	D_2	D_3	D_4	*Supply*
O_1	5	4	9	2	32
O_2	7	6	10	7	28
Re*quirement*	18	16	14	12	60

(C) Write any **one** : **3**

(1) Explain General Mathematical Model of Assignment Problem.

(2) Solve the following transportation problem by Matrix minima and find Total Cost.

	D_1	D_2	D_3	D_4	*Supply*
O_1	8	5	9	7	20
O_2	6	4	2	10	40
O_3	6	1	3	3	60
Re*quirement*	20	50	25	25	120

(D) Write any **one** : **5**

(1) Explain General Mathematical Model of Transportation problem.

(2) Solve the following transportation problem by Vogel's method and find Total Cost.

	D_1	D_2	D_3	D_4	*Supply*
O_1	11	6	15	3	16
O_2	7	8	4	13	18
O_3	22	17	8	31	24
Re*quirement*	11	15	17	15	58