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AAH-003-001663 **Seat No. _____**

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

March / April - 2016

S-602 : Statistics

(Statistical Quality Control & Operation Research)

(New Course)

Faculty Code : 003

Subject Code : 001663

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

Instructions : (1) Write answers of MCQ in answer sheet.
(2) Students can use their own calcualtion.

1 Multiple Choice Question : **20**

(1) Variation in the items produced in a factory may be due to

(A) chance factors (B) assignable causes

(C) both (A) and (B) (D) None of these

(2) Cent percent inspection is preferable when

(A) a defective item may cause danger to life

(B) a defective item may stop the function as a whole

(C) the incoming item are of very poor quality

(D) All of these

(3) The Shewhart control charts are meant

(A) To detect whether the process is under statistical quality control.

(B) To find the assignable causes

(C) To reflect the selection of sample

(D) All of these.

(4) The small fraction of defectives p_2, on the basis of which a lot is not rejected except for a small number of times is called

(A) AQL (B) RQL

(C) LTPD (D) None of these

(5) OC curve reveals the ability of the sampling plan to distinguish between

(A) good and bad lots

(B) good and bad sampling lot

(C) good and bad product

(D) All of these

(6) In $\bar{X}$ chart, _____ is probability that sample point follow in out side of control limits.

(A) 0.0072 (B) 0.0027

(C) 0.9973 (D) None of these

(7) _____ charts is used for controlling number of defects in a TV set.

(A) $\bar{X} - R$ (B) σ

(C) $p - np$ (D) C

(8) For $\bar{X}$-chart UCL=325 and LCL =275, then CL= ____

(A) 50 (B) 600

(C) 300 (D) 25

(9) If $\bar{c} = 2.25$, the lower control limit of C-chart is

(A) 0 (B) 3.75

(C) –2.25 (D) 2.25

(10) Acceptance sampling plans are preferable due to

(A) the economy in inspection

(B) protection to perishable items

(C) increased efficiency in the inspection of items

(D) All of these

(11) The role of artificial variables in the simplex method is

(A) to aid in finding an initial solution

(B) to find optimal dual prices in the final simplex table.

(C) to start phases of simplex method

(D) All of these

(12) The solution to a transportation problem with m rows and n columns is feasible if number of positive allocation

(A) $m + n$ (B) $m \times n$

(C) $m + n - 1$ (D) $m + n + 1$

(13) The solution space of an LP problem unbounded due to _____

(A) objective function is unbounded

(B) an incorrect formulation of the LP model

(C) neither (A) nor (B)

(D) both (A) and (B)

(14) For maximum LP model the simplex method is terminated when all value

(A) $c_j - z_j \leq 0$ (B) $c_j - z_j \geq 0$

(C) $c_j - z_j = 0$ (D) $z_j \leq 0$

(15) The dual of the primal minimization LP problem having m constraints and n non-negative variables should

(A) have m non-negative variables and n constraints

(B) be a maximization LP problem

(C) both (A) and (B)

(D) None of these

(16) If there were n workers and n jobs there would be

(A) $n!$ (B) $(n - 1)!$

(C) $(n!)^n$ (D) n solution

(17) An assignment problem can be solved by

(A) Simplex method

(B) transportation method

(C) both (A) and (B)

(D) None of these

(18) To convert $\geq$ inequality constraints into equality constraints, we must

(A) add a surplus variable

(B) subtract an artificial variable

(C) subtracts a surplus variable and add an artificial variable

(D) add a surplus variable and subtract artificial variable.

(19) A feasible solution to LP problem

(A) must satisfy all of the problem's constraints simultaneously.

(B) need not satisfy all of the constraints only some of them.

(C) must be a corner point of the feasible region

(D) must optimize the value of the objective function

(20) If a primal LP problem has a finite solution then the dual LP problem should have

(A) finite solution

(B) infeasible solution

(C) unbounded solution

(D) None of these

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.

$n = 4,\ m = 30,\ \sum \bar{X} = 59.82, \sum R = 17.22,\quad A_2 = 0.729,$

$D_3 = 0,\quad D_4 = 2.28.$

(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) Discuss Single sampling plan

(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 transportations 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.

(5) Write the applications of Linear Programming.

3 (a) Give the answer : (any **three**) **6**

(1) Difference between *p* chart and *np* chart

(2) Define charts for attributes

(3) Explain consumer's risk

(4) Define Linear programming

(5) Define optimum feasible solution

(6) Define basic solution

(b) Give the answer (any **three**) 9

(1) Explain AQL.

(2) Derivation OC function for double sampling plan

(3) If in single sampling plan (1000, 100, 1) and also $AQL = 0.01$ and $LTPD = 0.07$ then obtain producer's and consumer's risk. $\left[e^{-1} = 0.37,\ e^{-7} = 0.001\right]$

(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

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

(c) Give the answer : (any **two**) **10**

(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 : $Z = 3x_1 + 5x_2 + 4x_3$

Subject to constraints :

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

(ii) $2x_1 + 5x_2 \leq 10$

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

(5) Obtain a solution of following transportations problem bye Vogel's method

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