DA-003-001663

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

April / May – 2015

S-602 : Statistical Quality Control & Operation Research

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) Write the answer of MCQ in the answer sheet.

(4) Right side figures indicate marks of that question.

1 M.C.Q. :   20

(1) For a maximization problem, the objective function coefficient for an artificial variable is :

(A) +M

(B) –M

(C) Zero

(D) None of these

(2) In the optimal Simplex table, $C_j - Z_j = 0$ value indicates :

(A) unbounded solution

(B) cycling

(C) alternative solution

(D) infeasible solution

(3) The graphical method of LP problem uses
    (A) objective function equation
    (B) constraint equation
    (C) linear equations
    (D) All of these

(4) A feasible solution to an 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

(5) If two constraints do not intersect in the positive quadrant of the graph then
    (A) problem is infeasible
    (B) the solution is unbounded
    (C) one of the constraints is redundant
    (D) None of these

(6) For maximization LP problem, the Simplex method is terminated when all values :
    (A) $C_j - Z_j \leq 0$ (B) $C_j - Z_j \geq 0$

    (C) $C_j - Z_j = 0$ (D) $Z_j \leq 0$

(7) If dual has an unbounded solution, primal has :
    (A) no feasible solution
    (B) unbounded solution
    (C) feasible solution
    (D) None of these

(8) The solution to a transportation problem with m-rows (supplies) and n-columns (destinations) is feasible if number of positive allocations are :

(A) $m+n$

(B) $m \times n$

(C) $m+n-1$

(D) $m+n+1$

(9) If we were to use opportunity cost value for an unused cell to test optimality, it should be :

(A) equal to zero

(B) most negative number

(C) most positive number

(D) any value

(10) If there were n workers and n jobs there would be :

(A) $n!$ solutions

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

(C) $(n!)^n$ solutions

(D) n solutions

(11) 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

(12) Control charts consist of :

(A) three control lines

(B) upper and lower control limits

(C) the level of the process

(D) All of these

(13) Main tools of statistical quality control are :

    (A) shewhart charts   (B) acceptance sampling plans

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

(14) 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 the above

(15) The small fraction of defective P_1, on the basis of which a lot is not rejected except for a small number of times is called :

    (A) Lot tolerance percentage defective (LTPD)

    (B) Rejecting percentage defective

    (C) Acceptance quality level (AQL)

    (D) None of these

(16) 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

(17) In $\bar{X}$-chart UCL = 256.3, $\bar{\bar{X}} = 250$ so LCL = _____.

    (A) 243.7   (B) 240

    (C) 234.7   (D) 230

(18) _____ charts is used for controlling number of defects in a T.V. Sets.

(A) $\bar{X} - R$ (B) C

(C) $P - np$ (D) None of these

(19) _____ distribution is used in the construction of P-chart.

(A) Normal   (B) Binomial

(C) Poisson   (D) None of these

(20) _____ distribution is used in the construction of P-chart

(A) Normal   (B) Binomial

(C) Poisson   (D) None of these

2 (a) Answer the following questions : (any **three**)   6

     (1) Explain the meaning of Low spot point with reference to P-chart.

     (2) Write the difference between P and np chart.

     (3) Define acceptance sampling plan.

     (4) What is meant by Quality of Product ?

     (5) Write the limits of $\bar{X}$, R, P and np charts.

     (6) Define optimal feasible solution in LP problem.

(b) Answer the following questions : (any **three**)   9

     (1) Explain Double sampling plan.

     (2) Explain Consumer risk.

     (3) Explain LTPD.

     (4) Explain Mathematical form of LP problem.

     (5) Write the dual to the following LP problem :

         Maximize $Z = x_1 - x_2 + 3x_3$

         Subject to constraints : $x_1 + x_2 + x_3 \leq 10$

$$2x_1 - x_3 \leq 2$$
$$2x_1 - 2x_2 - 3x_3 \leq 6$$

         and $x_1, x_2, x_3 \geq 0$

(6) Find the probability of accepting a lot if the fraction defective of lot is 0.05 using single sampling plan (100, 8, 1) by using Hyper Geometric distribution. Also obtain AOQ, ATI and ASN.

(c) Answer the following questions : (any **two**)   **10**

(1) Discuss different assignable cause of variations.

(2) Short note : Theory of Runs.

(3) Explain : ATI and derive function for single sampling.

(4) Obtain solution of the following Transportation problem by Vogel's method :

Source	Destination				Supply
	D_1	D_2	D_3	D_4	
O_1	19	30	50	10	7
O_2	70	30	40	60	9
O_3	40	8	70	20	18
Requirement	5	8	7	14	34

(5) Obtain optimum solution of dual from the following LP problem solution :

Maximize : $Z = 3x_1 + 4x_2$

Subject to constraints $2x_1 + 3x_2 \leq 16$

$2x_1 + x_2 \leq 8$

and $x_1, x_2 \geq 0$

3 (a) Answer the following questions : (any **three**)   6
   (1) What is variation in production ?
   (2) Define charts for variable.
   (3) Explain (1200, 150, 2).
   (4) Write the assumption of LP problem.
   (5) Define objective function in LP problem.
   (6) Define constrain in LP problem.

   (b) Answer the following questions : (any **three**)   9
   (1) Short note : Ideal OC curve.
   (2) Explain Producer risk.
   (3) Explain AQL.
   (4) Explain Transportation problem with example.
   (5) Use Graphical Method to solve the following
       LP problem :

   Maximize : $Z = 15x_1 + 10x_2$

   Subject to constraint : $4x_1 + 6x_2 \leq 360$

   $3x_1 \leq 180$

   $5x_2 \leq 200$

   and $x_1, x_2 \geq 0$

   (6) Solve the assignment problem that the objective is
       to minimize the total cost :

Work	Machine		
	P	Q	R
X	21	24	31
Y	11	19	17
Z	15	17	13

   (c) Answer the following questions : (any **two**)   10
   (1) Write the difference between $\overline{X} - R$ charts and
       P-np charts.
   (2) Derive OC function for single sampling plan.
   (3) For single sampling plan (2000, 200, 2), obtain
       OC function by using Poisson distribution.
       Also find producer's risk and consumer's risk if

   $AQL = P_1' = 0.05$ and $LTPD = P_2' = 0.035$ [$e^{-1} = 3.368$,

   $e^{-7} = 0.000912$]

(4) Obtain solution of LP problem by Simplex Method

Maximize : $Z = 40 x_1 + 50 x_2$

Subject to constraints $2x_1 + 3x_2 \leq 3$

$$8x_1 + 4x_2 \leq 5$$

and $x_1, x_2 \geq 0$

(5) Obtain a solution of the following transportation problem by the method :
(1) North-West corner
(2) Minimum Row.

Source	Destination			Supply
	A	B	C	
I	6	8	4	6
II	4	9	3	10
III	1	2	6	15
IV	5	7	2	4
Requirement	14	16	5	35

—————