

**FACULTIES OF ARTS AND SCIENCE**

Code No. 5028 / E

**B.A. / B.Sc. III – Year Examination, March / April 2015****Subject : STATISTICS (Theory)****Paper – IV****Quality Control, Reliability and Operations Research (Elective-I)****Time : 3 hours****Max. Marks : 100**

**Note : Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks. Scientific calculators are allowed.**

- I , 1 Explain the following terms.  
i) Control charts for variables ii) Control charts for attributes
- 2 Explain the difference between specification limits, tolerance limits and control limits in SQC.
- 3 Each of 10 lots of rubber belts contain 2000 rubber belts. Number of defective rubber belts in those lots are 412, 421, 326, 335, 298, 315, 292, 301, 325 and 299. Draw control chart for fraction defective and give your conclusions.
- 4 Describe how you construct a  $\bar{X}$  chart and R-chart? Explain their uses.
- II 5 Explain the procedure of double sampling plan. Obtain ASN and OC functions for the same.
- 6 What is single sampling plan? Discuss the relative merits and demerits of single and double sampling plans.
- 7 Define reliability. Explain the importance of hazard function in the computation of failure density.
- 8 Define system reliability. Explain how to compute the system reliability for K out of n system.
- III 9 Define terms i) Linear programming problem ii) Feasible solution  
iii) Basic feasible solution iv) Optimum basic feasible solution
- 10 Solve the following LPP graphically
- Minimize  $Z = -6x_1 - 4x_2$   
Subject to  $2x_1 + 3x_2 \geq 30$   
 $3x_1 + 2x_2 \leq 24$   
 $x_1 + x_2 \geq 3$   
and  $x_1, x_2 \geq 0$

- 2 -

11 What are surplus and slack variables? Explain Big-M method to solve an LPP.

12 Apply principle of duality to solve the LPP and also read the primal solution

$$\begin{aligned} \text{Minimize } Z &= 12x_1 + 20x_2 \\ \text{Subject to } 6x_1 + 8x_2 &\geq 100 \\ 7x_1 + 12x_2 &\geq 120 \\ \text{and } x_1, x_2 &\geq 0 \end{aligned}$$

IV 13 Solve the following transportation problem for optimality. Use VAM for obtaining initial basic feasible solution.

	Market				Supply
	1	2	3	4	
Ware house A	5	2	4	3	22
B	4	8	1	6	15
C	4	6	7	5	8
Demand	7	12	17	9	

14 Solve the following assignment problem by Hungarian method for optimality

Tasks	Men				
	I	II	III	IV	V
A	1	3	2	8	8
B	2	4	3	1	5
C	5	6	3	4	6
D	3	1	4	2	2
E	1	5	6	5	4

15 What is degeneracy in transportation problem? How it is resolved?

16 Find the sequence that minimizes the total elapsed time in performing following six jobs on three machines in the order  $M_1, M_2, M_3$ . Also find the idle time for these machines.

Job	1	2	3	4	5	6
Machine $M_1$	8	3	7	2	5	1
Machine $M_2$	3	4	5	2	1	6
Machine $M_3$	8	7	6	9	10	9

V Answer any **three** of the following :

17 Process control, product control

18 A situation where 100% inspection is needed

19 Two-phase method

20 p-chart and np-chart

21 Importance of SQC in industry

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