

B. Sc. DEGREE END SEMESTER EXAMINATION - OCTOBER 2025**SEMESTER 5 : STATISTICS FOR COMPUTER APPLICATION****COURSE : 19U5CRCST6 : STATISTICAL QUALITY CONTROL AND OPERATIONS RESEARCH***(For Regular 2023 Admission and Supplementary 2022/ 2021/ 2020/ 2019 Admissions)*

Time : Three Hours

Max. Marks: 75

(Use of Scientific calculator and statistical tables are permitted)**PART A****(Each Question carries 1 mark. Maximum marks from this part is 10)**

1. R-charts are preferable over σ -charts because:
 - (a) R and S.D. fluctuate together in case of small samples
 - (b) R is easily calculable
 - (c) R-charts are economical
 - (d) all the above
2. What is Statistical Quality Control?
3. Discuss the importance of R chart
4. Explain mathematical formulation of assignment problem.
5. Give any one use of control chart
6. Define OR.
7. List out the methods for finding initial feasible solution.
8. The control limits delimited by the consumer are called:
 - (a) modified control limits
 - (b) natural control limits
 - (c) specified control limits
 - (d) none of the above
9. Define natural tolerance limits.
10. Define basic feasible solution of transportation problem.
11. What are assignable causes?
12. Define alternative optimum in LPP.

PART B**(Each question carries 3 marks. Maximum marks from this part is 15)**

13. A farmer has recently acquired a 110 hectares piece of land. He has decided to grow wheat and Barley on that land. Due to the quality of the sun and the region's excellent climate, the entire production of wheat and Barley can be sold. He wants to know how to plant each variety in the 110 hectares, given the costs, net profits, and labor requirements. The cost of wheat is Php100 and the cost of Barley is Php200. The profit he will gain for each area of wheat is Php50 while Php120 for each area of Barley. The labor requirement for wheat is 10 days per hectare and 30 days per hectare for Barley. The farmer has a budget of Php10,000 and an availability of 1,200 days during the planning horizon. Find the total area for growing wheat and Barley to maximize its profit. What is the maximum profit?
14. Discuss the importance of quality control in the success of an organisation
15. Formulate the dual of the following LPP.
Maximize $z = 5x_1 + 3x_2$ subject to $3x_1 + 5x_2 \leq 15$, $5x_1 + 2x_2 \leq 10$, $x_1 \geq 0$, $x_2 \geq 0$.
16. Solve the game whose payoff matrix is given by

	M	N
P	1	-2
Q	2	-1

17. Explain north west corner method
18. Explain Shewhart control chart
19. You are given the values of sample range for ten samples of size 5 each. Draw range charts and comment on the state of control of the process

Sample no	1	2	3	4	5	6	7	8	9	10
Range	7	4	8	5	7	4	8	4	7	9

PART C

(Each question carries 5 marks. Maximum marks from this part is 20)

20. Explain the method of construction of c chart
21. Using the following cost matrix find the optimal job assignment and the associated cost.

	a	b	c
1	17	25	31
2	10	25	16
3	12	14	11

22. Solve the following LPP using graphical method.
Maximize $z = x + 3y$ subject to $2x + y \leq 20, x + 2y \leq 20, x \geq 0, y \geq 0$.
23. Explain the method of construction of control chart for number of defects per unit
24. Solve the following LPP using simplex method.
Maximize $z = 7x_1 + 5x_2$ subject to $x_1 + 2x_2 \leq 6, 4x_1 + 3x_2 \leq 12, x_1 \geq 0, x_2 \geq 0$.
25. Distinguish control charts for variables and control chart for attributes

PART D

(Each question carries 10 marks. Maximum marks from this part is 30)

26. Solve the following LPP using dual simplex method.
Minimize $z = 5x_1 + 7x_2 + 6x_3 + 3x_4$ subject to $4x_1 + 6x_2 + 5x_3 - 3x_4 \geq 12, x_1 + 5x_2 + 2x_3 + x_4 \geq 8, -6x_1 + x_2 - 5x_4 \geq 8, x_1 \geq 0, x_2 \geq 0, x_3 \geq 0, x_4 \geq 0$.
27. Explain the significance of efficient system of statistical quality control in modern business and industry.
28. You are given the values of sample mean and sample range for ten samples of size 5 each. Draw mean and range charts and comment on the state of control of the process

Sample no	1	2	3	4	5	6	7	8	9	10
Mean (Xbar)	12.5	11.8	10.8	11.6	11.0	9.6	10.4	9.6	10.6	10.0
Range	7	4	8	5	7	4	8	4	7	9

29. Solve the following Transportation problem starting with the initial solution obtained by VAM.

	P	Q	R	S	Supply
A	2	2	2	1	3
B	10	8	5	4	7
C	7	6	6	8	5
Demand	4	3	4	4	15