B.Sc. DEGREE END SEMESTER EXAMINATION : NOVEMBER 2023
SEMESTER 5 : STATISTICS FOR COMPUTER APPLICATION
COURSE : **19U5CRCST6 : STATISTICAL QUALITY CONTROL AND OPERATIONS RESEARCH**
(For Regular 2021 Admission and Supplementary 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. Define defects and defectives.
2. Number of defects follows which distribution?
3. Define unbalanced transportation problem.
4. Give any one importance of p chart.
5. Define natural tolerance limits.
6. What is statistical quality control?
7. State one limitation of OR.
8. Define feasible solution of transportation problem.
9. What is an optimal solution in LPP?
10. What is the use of revised control limit?
11. Give any two use of SQC.
12. Define unbalanced assignment problem.

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

13. A chocolate manufacturing company produces only two types of chocolate, A and B. On each sale, the company makes a profit of $6 per unit of A sold and $5 per unit of B sold. Both the chocolates require milk and chocolate only. Each unit of A requires 1 unit of milk and 3 units of chocolate. Each unit of B requires 1 unit of milk and 2 units of chocolate. The company kitchen has a total of 5 units of milk and 12 units of chocolate. The company wishes to maximize its profit. How many units of A and B should it produce respectively?

14. Discuss the importance of quality control in the success of an organisation.

15. Explain Vogel's approxiamation method.

16. Differentiate between assigment problem and transportation problem.

17. 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?

18. What are the objectives of SQC?

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 Xbar chart.

21. Explain dual simplex method.

22. Differentiate between p-chart and c-chart in the context of SQC.

23. Solve the following LPP using graphical method.
    Maximize $z=60x+40y$ subject to $2x+y\leq60, x\leq25, y\leq35, x\geq0, y\geq0$

24. 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

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 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

27. The following data pertains to 6 samples of bolts tested for hardness.

Sample no	Hardness rating			
1	47.1	47.2	47.2	48.1
2	46.1	47.1	47.8	45.4
3	45.0	44.1	44.1	44.3
4	44.7	44.6	43.1	43.3
5	45.9	45.7	46.5	44.4
6	47.1	46.7	46.1	45.5

Calculate the control limits for averages and ranges and draw Xbar and R chart.

28. Explain the significance of efficient system of statistical quality control in modern business and industry.

29. Solve the following LPP using graphical method.
    Maximize $z=5x_1+7x_2$ subject to the constraints $x_1+x_2 \leq 4, 3x_1+8x_2 \leq 24, 10x_1+7x_2 \leq 35, x_1\geq0, x_2\geq0$.