School of Basic Sciences
Bachelor of Science in General
Semester End Examination - Nov 2023

Duration : 180 Minutes
Max Marks : 100

Sem V - C1UC503T - Number Theory and Game Theory

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1) For the game [1 -2 2 ; -6 -4 6],find saddle point. — K1 (2)

2) Show that the sequence a_n, where $a_n = 3n$ for every non-negative integer n, is a solution of the recurrence relation $a_n = 2a_{n-1} - a_{n-2}$ for n=2,3,4……. Answer the same for $a_n = 2^n$ — K2 (4)

3) What is the largest power of 2 that divides 97!. Explain. — K2 (6)

4) You have a 13oz.bottle and a 20 oz.bottle, with which you wish to measure exactly 2 oz. However, you have a limited supply of water. If any water enters either bottle and then gets dumped out, it is gone forever. What is the least amount of water you can start with and still complete the task? Solve. — K3 (9)

5) Apply Graphical method to solve the game — K3 (9)

Player B

Player A	B1	B2
A1	1	2
A2	4	5
A3	9	-7
A4	-3	-4
A5	2	1

6) Two player A and B match coins. If the coins match, then A wins two units of value, if the coin do not match, then B win 2 units of value. Evaluate the optimum strategies for the players and the value of the game — K5 (10)

7) Analyze the following linear Diophantine equation, using modular arithmetic (describe the general solutions) 17x+8y=31 — K4 (12)

8) State and prove minimax theorem for two-person zero-sum games. — K5 (15)

9) Prove Euler's theorem of Number theory. — K5 (15)

10) For the following payoff matrix, transform the zero-sum game into an equivalent linear programming problem and solve it by using the simplex method K6 (18)

Player B

Player A	B1	B2	B3
A1	1	-1	3
A2	3	5	-3
A3	6	2	-2