Total No. of Printed Pages: 03

PRN No.		PAPER CODE	U313-231-ESE

December 2023 (ENDSEM) EXAM

TY (SEMESTER - I)

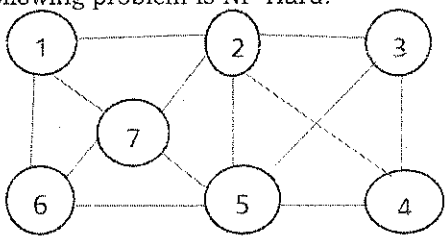
COURSE NAME: DESIGN AND ANALYSIS OF ALGORITHM **Branch:Computer Engineering** **COURSE CODE: CSUA31208**

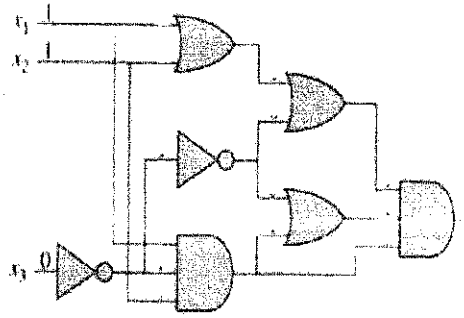
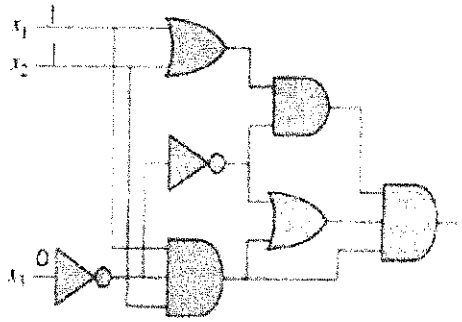
(PATTERN 2020)

Time: [1Hr. 30 Min] **[Max. Marks: 40]**

Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed**
3) **Use suitable data wherever required**
4) **All questions are compulsory. Solve any one sub question from Question 3 and any two sub questions each from Questions 4, 5 and 6 respectively.**

Q. No.	Question Description	Max. Marks	CO mapped	BT Level
Q.1	a) Identify the Best, Worst, Average Case time complexity for searching a number x in an array	[2]	1	Apply
Q2	a) Solve the given problem (Knapsack) using greedy method. Find out the profit earned and the fraction of objects chosen. No. of objects = 3 , M =20 P1 ,P2, P3 = (36,35,18) and W1, W2, W3 = (18, 15 ,10)	[2]	2	Apply
Q3.	a) Solve the following 0/1 Knapsack problem using Backtacking $n = 4$, $(p_1, p_2, p_3, p_4) = (10, 10, 12, 18)$ $m = 15$, $(w_1, w_2, w_3, w_4) = (2, 4, 6, 9)$	[6]	3	Apply
	b) Make use of 4-queens example to justify the statement "LC search strategy is better than FIFO and LIFO"	[6]	3	Apply
Q.4	a) Identify the Clique for the following Graph and Prove that following problem is NP-Hard. 	[5]	4	Apply
	b) Consider an instance of 3-SAT having 4 variables : x_1, x_2, x_3, x_4 which has following 3 clauses $C_1 : (x_1' \vee x_2 \vee x_3')$ $C_2 : (x_2' \vee x_3 \vee x_4)$ $C_3 : (x_1' \vee x_2' \vee x_4)$	[5]	4	Apply

	Construct the Hamiltonian Cycle Problem for this 3-SAT. Provide the interpretation of the clause. c) Make use of the following 2 instances of circuit satisfiability and explain which instance is satisfiable and which is not satisfiable. Justify your answer with appropriate explanation.  (a)  (b)	[5]	4	Apply
Q.5	a) Solve Travelling salesperson problem using approximation algorithm with an example. b) Apply randomized quicksort algorithm to solve the given input (10, 20,30,40,50, 60), and mention its time complexity. c) Identify and describe any two Parent selection methods while using genetic algorithms.	[5] [5] [5]	5 5 5	Apply Apply Apply
Q.6)	a) Make use of a parallel technique in assessing problems such as the addition/multiplication of a set of numbers or determining the minimum/maximum within a set. Discuss its performance in terms of time complexity, speedup, and efficiency. [5]	[5] [5]	6 6	Apply Apply

	b) Utilize a PRAM algorithm to compute the prefix product (multiplication) of a given set of 16 numbers {3, 0.5,2,3,4,0.5,2,4,6,0.5,2,6,2,0.5,2,7}. c)Construct a multithreaded algorithm for multiplying two matrices of dimensions m x n and n x p concurrently. Discuss how you would distribute the workload among multiple threads to enhance performance. Additionally, analyze the potential challenges and synchronization mechanisms that need to be considered in implementing this multithreaded matrix multiplication algorithm.	[5]	6	Apply