Q. Code:232118

Reg. No. | | | | | | | | | | | | | |

B.E./ B.TECH. DEGREE EXAMINATIONS, MAY 2023

Fourth-Semester

CS18405 – DESIGN AND ANALYSIS OF ALGORITHMS

(Computer Science and Engineering)

(Regulation2018/2018A)

TIME:3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	The students will be able to analyze the running time of algorithms using asymptotic analysis	**2**
CO 2	The students will be able to describe the divide-and-conquer techniques and analyze the running time of the algorithms synthesizing those paradigms	**2**
CO 3	The students will be able to describe the dynamic programming and greedy paradigms and analyze the running time of the algorithms using those techniques	**3**
CO 4	The students will be able to employ linear programming and computational geometry methods to solve engineering problems	**4**
CO 5	The students will be able to describe the non-deterministic polynomial algorithms	**5**

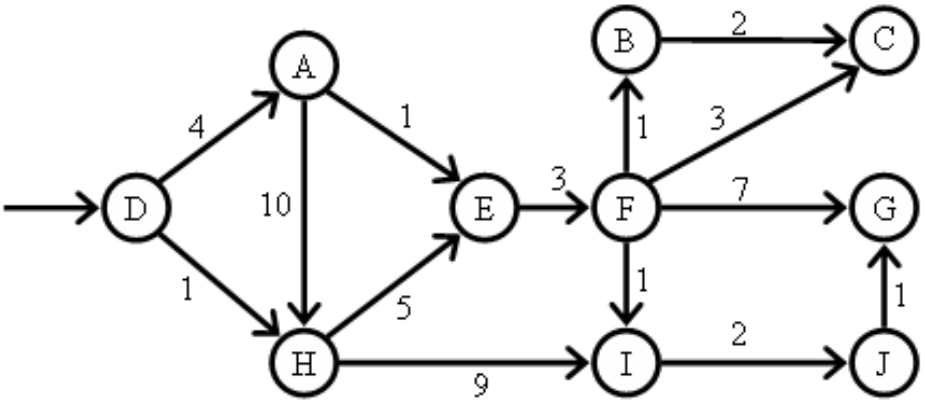
PART- A(10x2=20Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Arrange the following functions in increasing orders of their growth. n!, log n, 3^n, n , n^2, n^3, 2^n, n log n.	**1**	**2**
2.	State the three steps to be proved using a loop invariant.	**1**	**2**
3.	Illustrate the significance of employing the 'divide and conquer' technique in algorithm design.	**2**	**2**
4.	Derive the worst case time complexity of Merge sort using Master's theorem.	**2**	**4**
5.	Compare dynamic programming and divide and conquer design technique.	**3**	**3**
6.	Write the merits and demerits of greedy algorithms	**3**	**3**
7.	Differentiate feasible and optimal solutions in linear programming	**4**	**3**
8.	How simplex method identify optimal solution and determine whether the problem is infeasible or unbounded?	**4**	**3**
9.	Derive the relationship of NP- complete problems with other classes P and NP- hard	**5**	**4**
10.	Illustrate the backround of Clique problem.	**5**	**4**

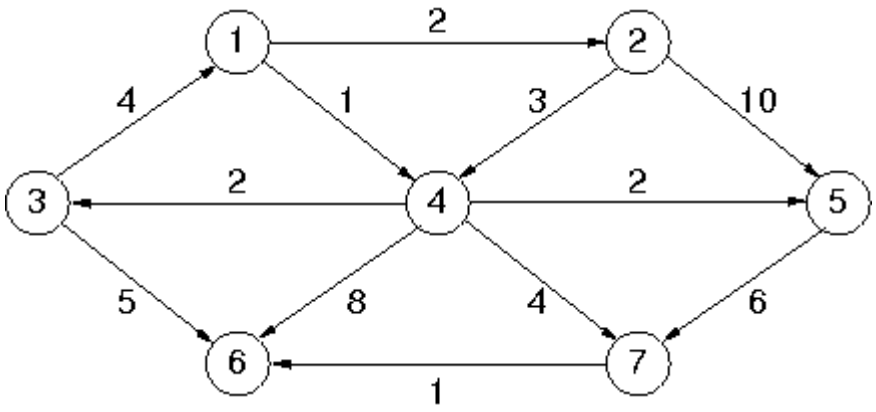
PART- B (5x 14=70Marks)

			Marks	CO	RBT LEVEL
11. (a)		Discuss insertion sort algorithm. Analyse its best and worst case complexity.	**(14)**	**1**	**2**
		(OR)			
(b)	**(i)**	Discuss about the Big oh, big omega and big theta notations with suitable examples.	**(7)**	**1**	**2**
	(ii)	Write a recursive algorithm to compute x^y and analyse it's complexity.	**(7)**	**1**	**2**
12. (a)	**(i)**	Solve the recurrence relation using recursive tree method $T(n)=4T(n/2) + n$; $T(1)=1$	**(7)**	**2**	**2**
	(ii)	Solve using masters method $T(n) = 4T(n/2) + n^2$ $T(n) = 2\ T(n/2) + n^3$	**(7)**	**2**	**2**
		(OR)			
(b)		Discuss with an example, the working of finding closest pair of points in a Cartesian plane using divide-and-conquer strategy. Derive the complexity of the algorithm.	**(14)**	**2**	**2**
13. (a)		Write the Dijkstra's algorithm. Find the shortest path from node 'A' to all other nodes using Dijkstra's algorithm.	**(7)**	**3**	**3**

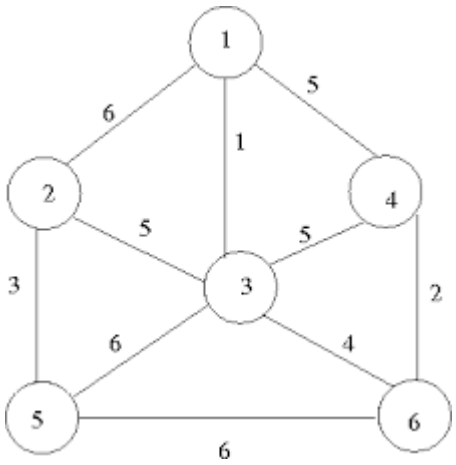


(OR)

(b) **(i)** Find the MST for the following weighted graph using Prim's Algorithm. **(7)** **3** **3**



(ii) Find the MST for the following weighted graph using Kruskal's Algorithm. **(7)** **3** **3**



14. (a) Solve the problem using Simplex method. **(14)** **4** **3**

Maximize Z = 5x1 +8 x2

subject to constraints

$2x1 + x2 \leq 100$

$x1 + 3x2 \leq 90$

$x1, x2 \geq 0$

(OR)

(b) Illustrate Graham's scan and Jarvis's march algorithms for the construction of convex hull with its complexity. **(14)** **4** **3**

		Marks	CO	RBT LEVEL
15. (a)	Analyse the backround of Circuit satisfiability problem with example. Prove that circuit satisfiability is NP-complete.	**(14)**	**5**	**4**
	(OR)			
(b)	Analyse the backround of the Vertex cover problem with example. Prove that Vertex Cover is NP-complete.	**(14)**	**5**	**4**

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Consider the list of marks obtained by 'n' students in a subject. Write an efficient algorithm to find and count the number of unique marks and display duplicate marks with its frequency. Analyse the algorithm's efficiency.	**(10)**	**1**	**5**