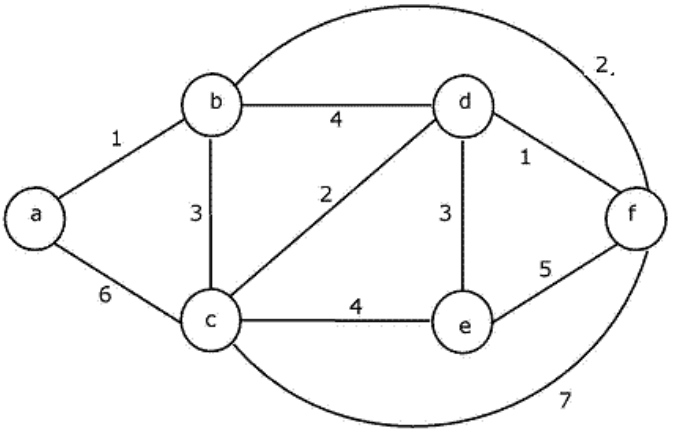
K. J. Somaiya College of Engineering, Mumbai-77
(Autonomous College Affiliated to University of Mumbai)
Semester: **January –May 2021**
In-Semester Examination

Class: SY B.Tech
Branch: COMP **Semester: IV**
Full name of the course: Analysis of Algorithms **Course Code: 2UCC402**
Duration: 1hr.15 min (attempting questions) **Max. Marks: 30**
+15 min (uploading)

Q. No	Questions	Marks
Q1	Multiple choice questions. Select the correct option from the following:	Total 10 marks

1.1	What is the complexity of the program given below:
	
	`void function(int n) {`
	`int i, j, k , count =0;`
	`for(i=n/2; i<=n; i++)`
	`for(j=1; j<=n; j= 2 * j)`
	`for(k=1; k<=n; k= k * 2)`
	`count++;`
	`}`
	
	a. $O(n^3)$
	b. $O(n^2)$
	c. $O(n\log^2 n)$.
	d. O(logn)	

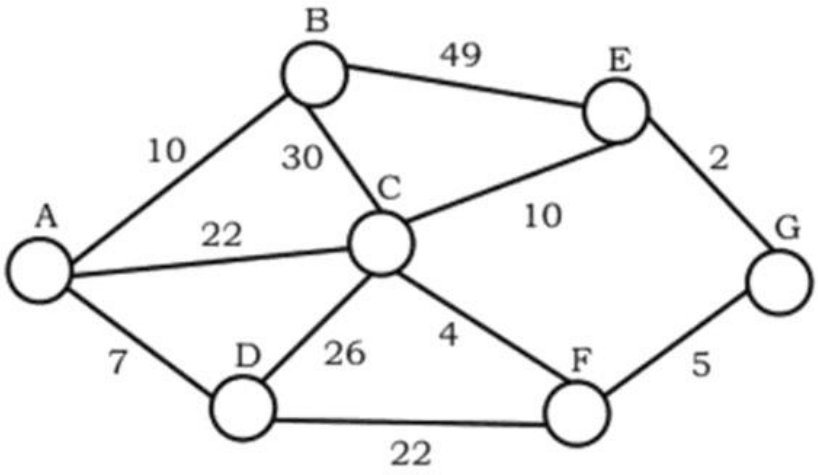
1.2	Using Kruskal's algorithm, which is the incorrect sequence of edges considering the following graph:	



a. (a—b),(d—f),(b—f),(d—c),(d—e)
b. (a—b),(d—f),(d—c),(b—f),(d—e)
c. (d—f),(a—b),(d—c),(b—f),(d—e)
d. (d—f),(a—b),(b—f),(d—e),(d—c)

1.3

Consider the undirected graph below



Using Prim's Algorithm to construct a minimum spanning tree starting with node A, which of the following sequence of edges represent a possible order in which edges would be added to construct the MST?

a. (E, G), (C,F), (F,G), (A,D), (A,B), (A,C)
b. (A,D), (A,B), (A,C), (C,F), (G,E), (F,G)
c. (A,B), (A,D), (D,F), (F,G), (G,E), (F,C)
d. (A,D), (A,B), (D,F), (F,C), (F,G), (G,E)

1.4	Arrange the following functions in increasing order of growth of functions: f1(n) = 2^n f2(n) = n^(3/2) f3(n) = nLogn f4(n) = n^(Logn) a. f3, f2, f1, f4 b. f3, f2, f4, f1 c. f3, f1, f4, f2 d. f2, f3, f4, f1	
1.5	Given {3, 6, 8, 9} and {1, 4, 7, 10} are two sub arrays which are to be merged by the Merge procedure in the Merge-sort algorithm. How many comparisons are made by the algorithm to form the array {1, 3, 4, 6, 7, 8, 9, 10}? a. 6 b. 7 c. 5 d. 8	

1.6	What is the time complexity of the following recursive function?
	
	`int dosomething(int n)`
	`{`
	`If (n ≤ 2)`
	`return 1;`
	`Else`
	`return (dosomething (floor (sqrt(n)))+n);`
	`}`
	
	a. $\theta(n^2)$
	b. $\theta(nlogn)$
	c. $\theta(logn)$
	d. $\theta(loglogn)$	

1.7	If given an array of integers that are already sorted and also been circularly shifted by K positions to the right. What is the minimum complexity in which you can find the value of K . a. Use Sorting Algorithm in O(N log N) b. Use binary search in O(log N) c. Check Manually in O(N) d. Use linear search O(N)	

1.8	The function f(n): $n^4 + 100n^2 + 50 = O(n^4)$ when a. c=1, $n_0 = 10$ b. c=2, $n_0 = 10$ c. c=2, $n_0 = 11$ d. c=1, $n_0 = 11$	
1.9	The solution of the recurrence $$T(n) = 8T\left(\frac{n}{2}\right) + n^2$$ a. $O(n^2)$ b. $O(n \log^2 n)$ c. O(n logn) d. $O(n^3)$	
1.10	Let G be an undirected graph with distinct edge weight. Let e_{max} be the edge with maximum weight and e_{min} be the edge with minimum weight, which of the following statements is false? a. No minimum spanning tree contains e_{max} b. G has a unique minimum spanning tree. c. Every minimum spanning tree of G must contain e_{min}. d. If e_{max} is in a minimum spanning tree, then its removal must disconnect G.	
Q2	What is the difference between iterative and recursive algorithms? (Any 4 points) Solve the following Recurrence relation using Substitution Method. $T(n) = 2T(\sqrt{n}) + 1 \quad n>2$ $= 1 \quad n=2$	10 marks
Q3	Let S= {a, b, c, d, e, f, g} be collection of objects with benefit-weight values as follows: a:(12, 4), b:(10, 6), c: (8, 5), d: (11 ,7) , e: (14, 3), f (7, 1) , g (9, 6). What will be the optimal solution to the fractional knapsack problem for S assuming we have a sack that can hold objects with total weight 18? To solve the same: - Define the problem & the strategy - State the answer(s) clearly - Write the analysis. **OR**	10 marks

	Explain the working of Merge Sort? Trace the Merge sort algorithm to sort the list G,U,J,A,R,A,T in alphabetical order. Give the instance where mergesort has the worst case complexity.	