University of Mumbai

Examination June 2021

Examinations Commencing from 1st June 2021

Program: **Computer Engineering**

Curriculum Scheme: Rev2019

Examination: SE Semester IV

Course Code: CSC402 and Course Name: Analysis of Algorithm

Time: 2 hour Max. Marks: 80

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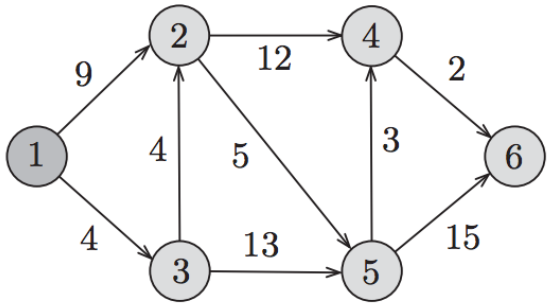
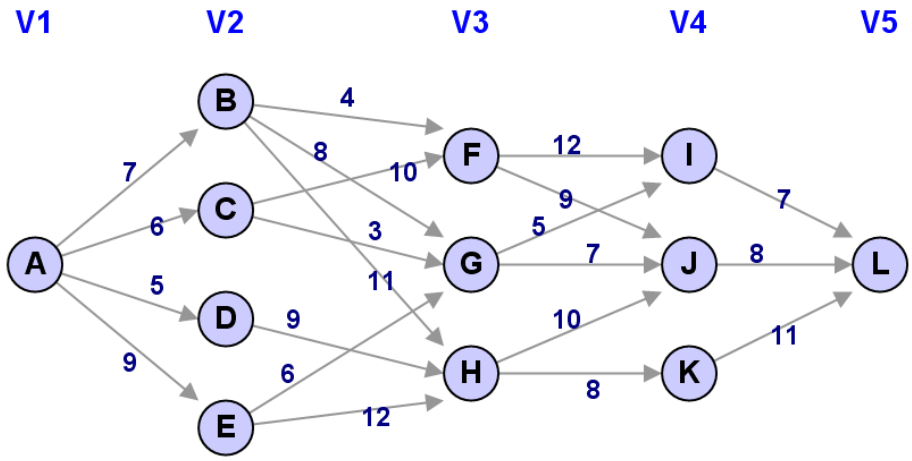
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Which of the following is not $O(n^2)$?
Option A:	$(5^{10}) * n + 990$
Option B:	$N^{1.45}$
Option C:	$n^3 / (\sqrt{n})$
Option D:	$(3^{50}) * n$
2.	If A is asymptotically less efficient than B, it means?
Option A:	B will be a better choice for all inputs
Option B:	B will be a better choice for all inputs except possibly small inputs
Option C:	B will be a better choice for all inputs except possibly large inputs
Option D:	B will be a better choice for small inputs
3.	In Quicksort algorithm, there is a procedure for finding a pivot element that splits the array into two sub-arrays, each of which contains at least Two-fifth of the elements. Let T(n) be the number of comparisons required to sort n elements. Then
Option A:	$T(n) <= 2T(n/5) + n$
Option B:	$T(n) <= T(2n/5) + T(3n/5) + n$
Option C:	$T(n) <= 2T(4n/5) + n$
Option D:	$T(n) <= 2T(n/2) + n$
4.	What is the result of following recurrences $T(n)=aT(n/b)+n^c$?
Option A:	$T(n) = O(n^{\log_b a})$
Option B:	$T(n) = O(n^c \log n)$
Option C:	$T(n) = O(f(n))$
Option D:	$T(n) = O(n^2)$
5.	The class of decision problems that can be solved by non-deterministic polynomial algorithms are called as.
Option A:	NP
Option B:	P
Option C:	Hard
Option D:	Complete
6.	If you are sorting in ascending order with insertion sort, average case running time it will take is?
Option A:	O(N)

Option B:	O(N log N)
Option C:	O(log N)
Option D:	$O(N^2)$
7.	Worst case time complexity of merge sort is
Option A:	O(n log n)
Option B:	$O(n^2)$
Option C:	$O(n^2 \log n)$
Option D:	$O(n \log n^2)$
8.	Apply Quick sort on a given sequence 6 10 13 5 8 3 2 11. What is the sequence after first phase, pivot is first element?
Option A:	5 3 2 6 10 8 13 11
Option B:	5 2 3 6 8 13 10 11
Option C:	6 5 13 10 8 3 2 11
Option D:	6 5 3 2 8 13 10 11
9.	Consider the graph M with 3 vertices. Its adjacency matrix is shown below. Which of the following is true? 0 2 2 2 0 2 2 2 0
Option A:	Graph M has no minimum spanning tree
Option B:	Graph M has a unique minimum spanning trees of cost 4
Option C:	Graph M has 3 distinct minimum spanning trees, each of cost 4
Option D:	Graph M has 3 spanning trees of different costs
10.	Given items as {value, weight} pairs {{60,10}, {20,10}, {40,5}}. The capacity of knapsack=20. Find the maximum value output assuming items to be divisible.
Option A:	110
Option B:	80
Option C:	100
Option D:	40
11.	A graph with negative weight cycle is having _____no. of shortest paths
Option A:	One
Option B:	Two
Option C:	Zero
Option D:	Infinite
12.	Floyd Warshall Algorithm falls into _____
Option A:	Greedy technique
Option B:	Dynamic Programming
Option C:	Linear Programming
Option D:	Backtracking
13.	In assembly line scheduling problem, _____ lookup tables are required.
Option A:	0
Option B:	1
Option C:	2
Option D:	3

14.	A travelling salesman problem with 55 cities has_____no. of feasible tours.
Option A:	37 arcs
Option B:	54 arcs
Option C:	55 arcs
Option D:	990 arcs
15.	_____is not a branch and bound strategy to generate branches
Option A:	LIFO branch and bound
Option B:	FIFO branch and bound
Option C:	Lowest cost branch and bound
Option D:	Highest cost branch and bound
16.	Of the following given options, which one of the following is a correct option that provides an optimal solution for 4-queens problem?
Option A:	(3,1,4,2)
Option B:	(2,3,1,4)
Option C:	(4,3,2,1)
Option D:	(4,2,3,1)
17.	Chromatic number of a graph is _____no of colors required to color the vertices in graph.
Option A:	Maximum
Option B:	Same
Option C:	Minimum
Option D:	More than Number of vertices
18.	In Rabin and Karp Algorithm, preprocessing can be done in
Option A:	$\theta(m^2)$
Option B:	θ (mlogn)
Option C:	θ (m)
Option D:	O(n)
19.	What happens when the modulo value(q) is taken large?
Option A:	Complexity increases
Option B:	Spurious hits occur frequently
Option C:	Cost of extra checking is low
Option D:	Matching time increases
20.	Given a pattern of length- 5 window, find the spurious hit in the given text string. Pattern: 7 3 9 9 2 Modulus: 13 Index: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 Text: 2 3 5 9 0 2 3 1 4 1 5 2 6 7 3 9 9 2 1 3 9

Option A:	6-10
Option B:	12-16
Option C:	3-7
Option D:	13-17

Q2	**Solve any Four out of Six** **5 marks each**
A	Explain Master theorem with example
B	Define P, NP, NP-Hard and NP-Complete Complexity Classes.
C	Discuss Complexity of Quicksort Algorithm in all cases.
D	Rewrite Binary Search Algorithm and Explain its complexity
E	Find LCS for strings X= "ABSDG" and Y= "GBSTR"
F	Write short note on Rabin Karp Algorithm

Q3.	**Solve any Two Questions out of Three** **10 marks each**
A	Apply Dijkstra algorithm on following graph. Show all intermediate steps. 
B	Explain 15 Puzzle problem with Branch and Bound method
C	Find a minimum cost path from A to L in the following multistage graph 

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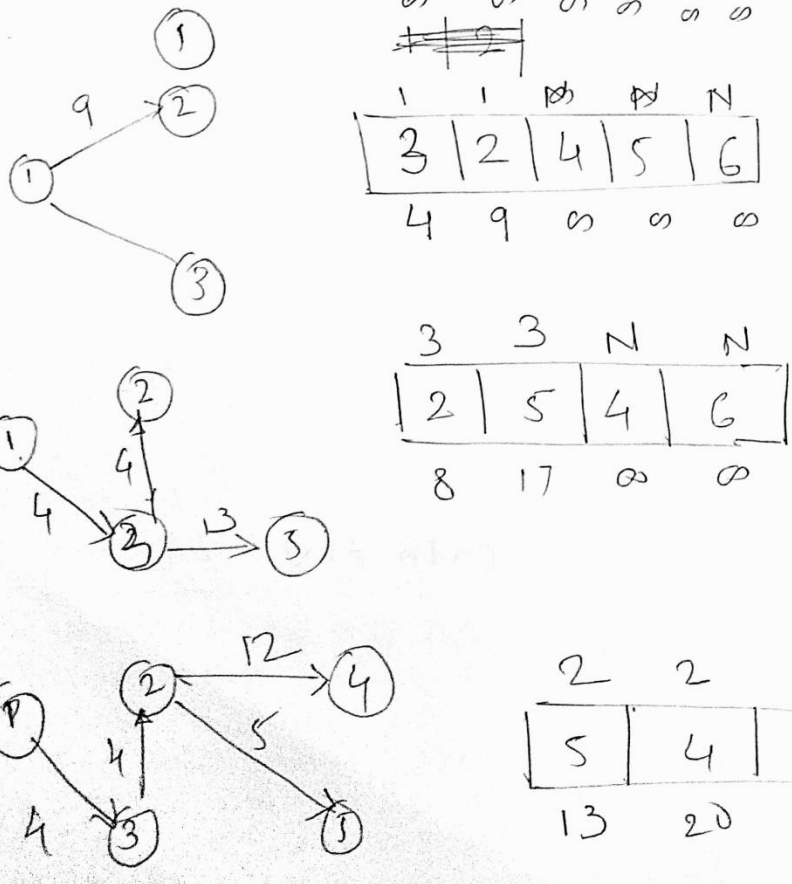
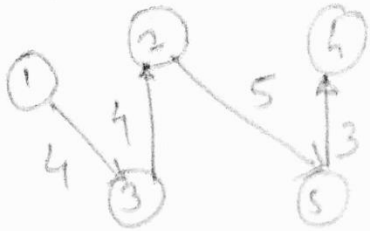
Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	C
Q2.	B
Q3.	B
Q4	A
Q5	A
Q6	D
Q7	A
Q8.	B
Q9.	C
Q10.	A
Q11.	C
Q12.	B
Q13.	C
Q14.	C
Q15.	D
Q16.	A
Q17.	C
Q18.	C
Q19.	C
Q20.	A

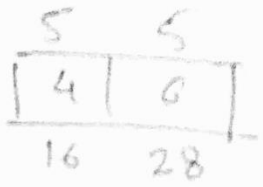
Q 2. E.

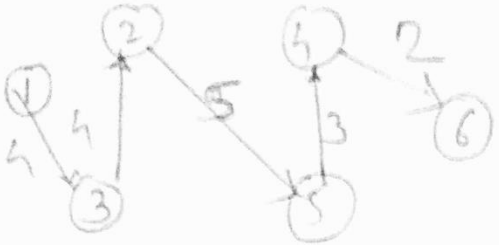
	G	B	S	T	R
	0	∞	∞	∞	∞
A	0	0	∞	∞	∞
B	0	0	1	1	1
S	0	0	1	2	2
D	0	0	1	2	2
G	0	1	1	2	2

Q. 3 A.









6 3 B

Forward approach.

	d	P
L	0	–
K	11	L
J	8	L
I	7	L
H	18	J
G	12	I
F	17	J
E	18	G
D	27	H
C	15	G
B	20	G
A	21	G

A - C - G - I - L

Path cost = 21