

**DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI
SECOND SEMESTER 2020 – 2021
ACADEMIC-UNDERGRADUATE STUDIES DIVISION
DEPARTMENT OF COMPUTER SCIENCE**

**Questions: 6
Pages: 2**

COURSE : Design and Analysis of Algorithms (CS F364)

COMPONENT : Test -1 (Closed Book)

WEIGHTAGE : 20% (40 Marks)

DATE : 11-Mar-2021, Thursday

DURATION : 50 Minutes (08:30 am - 09:20 am)

Note: Scan and upload only between (09:20 am to 09:30 am).

Submissions beyond 09:30 am will not be accepted.

Q. 1	Solve the recursive equation using recursion tree method and find the complexity. The recurrence equation is of the form given below $T(N)=a T(N/b) + f(n)$ $T(1)=1$ $a=4, b=3, f(n)=N$	6																		
Q. 2	a) Given a series of numbers, sort them on applying merge sort using divide and conquer approach. As you sort them, write a sequence number (1, 2 ,3) following the way in which the divide and merge operation takes place. Write the number of division operation, merging operation and the total number of operations to sort the items. Nos: 14 12 100 20 13 2 8 6 10 18 b) Write the pseudocode of merge sort.	8(5+3)																		
Q. 3	Consider the modified Partition algorithm named as ModifiedPartition , which is modified as: within $a[m],a[m+1],... ,a[p-1]$ the elements are rearranged in such a manner that if initially $t = a[m]$, then after completion $a[q] = t$ for some q between m and $p-1$, $a[k] >t$ for $m \leq k < q$ and $a[k] \leq t$ for $q < k < p$. q is returned. a) Write the algorithm for the ModifiedPartition b) For the given array show the stepwise single complete execution of the ModifiedPartition with pivot element as the first element of the array. Clearly show the values variables used in ModifiedPartition algorithm. [23, 18, 6, 11, 90, 5, 120, 33, 29, 2]	7(4+3)																		
Q. 4	Consider a knapsack problem. We have given a knapsack of capacity M and objects are present in two sets A and B . Each object of both sets has weight and profit corresponding to it. However, the objects are selected in sequence order. At first an object from set A then an object from set B and this order is repeated. Provide the solution to knapsack problem using Greedy method for the followings. Assume the fractional object selection is allowed. Capacity of the knapsack is 25, Set A: <table><tr><td>Object</td><td>A1</td><td>A2</td><td>A3</td><td>A4</td><td>A5</td></tr><tr><td>Weight</td><td>10</td><td>5</td><td>9</td><td>3</td><td>11</td></tr><tr><td>Profit</td><td>100</td><td>28</td><td>16</td><td>71</td><td>14</td></tr></table>	Object	A1	A2	A3	A4	A5	Weight	10	5	9	3	11	Profit	100	28	16	71	14	6
Object	A1	A2	A3	A4	A5															
Weight	10	5	9	3	11															
Profit	100	28	16	71	14															

	<div>Set B:</div> <table><tr><td>Object</td><td>B1</td><td>B2</td><td>B3</td><td>B4</td><td>B5</td></tr><tr><td>Weight</td><td>7</td><td>15</td><td>2</td><td>31</td><td>14</td></tr><tr><td>Profit</td><td>90</td><td>4</td><td>55</td><td>200</td><td>41</td></tr></table> <div>Represent the knapsack diagrammatically showing which all objects are selected into it. Compute the maximum profit achieved.</div>	Object	B1	B2	B3	B4	B5	Weight	7	15	2	31	14	Profit	90	4	55	200	41				
Object	B1	B2	B3	B4	B5																		
Weight	7	15	2	31	14																		
Profit	90	4	55	200	41																		
Q. 5	<div>There are seven jobs and, their deadlines and associated profits as shown-</div> <table><tr><td>Jobs</td><td>J1</td><td>J2</td><td>J3</td><td>J4</td><td>J5</td><td>J6</td></tr><tr><td>Profits</td><td>3</td><td>5</td><td>20</td><td>18</td><td>0</td><td>6</td></tr><tr><td>Deadlines</td><td>1</td><td>3</td><td>4</td><td>3</td><td>2</td><td>1</td></tr></table> <div>Answer the following questions-</div> <div><div>a) Write the optimal schedule that gives maximum profit.</div><div>b) Are all the jobs completed in the optimal schedule?</div><div>c) What is the maximum earned profit?</div></div>	Jobs	J1	J2	J3	J4	J5	J6	Profits	3	5	20	18	0	6	Deadlines	1	3	4	3	2	1	7(3+2+2)
Jobs	J1	J2	J3	J4	J5	J6																	
Profits	3	5	20	18	0	6																	
Deadlines	1	3	4	3	2	1																	
Q. 6	<div>What is the problem with Dijkstra Algorithm in greedy programming. Explain the problem and how the problem has been handled using dynamic programming. Explain them with the help of graph.</div>	6(3+3)																					

***** ALL THE BEST *****

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI, DUBAI CAMPUS

**DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI
SECOND SEMESTER 2020 – 2021
ACADEMIC-UNDERGRADUATE STUDIES DIVISION
DEPARTMENT OF COMPUTER SCIENCE**

**Questions: 5
Pages: 2
SET A**

COURSE : Design and Analysis of Algorithms (CS F364)

COMPONENT : Test -2 (Open Book)

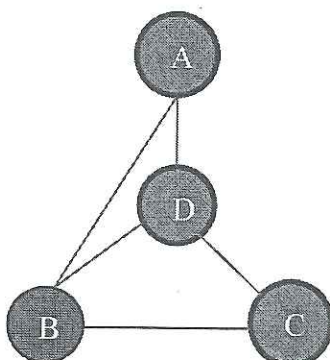
WEIGHTAGE : 20% (40 Marks)

DATE : 20-Apr-2021, T2

DURATION : 50 Minutes (08:30 am - 09:20 am)

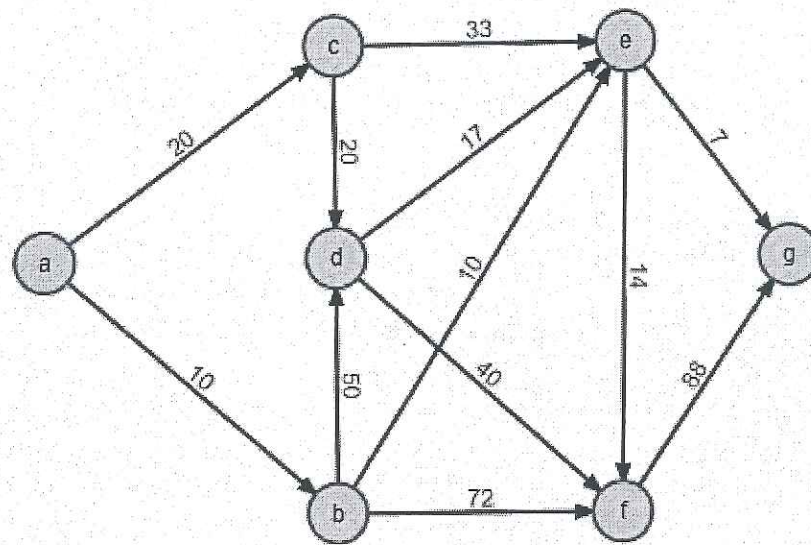
Note: Scan and upload only between (09:20 am to 09:25 am).

Submissions beyond 09:25 am will not be accepted.

Q. 1	<p>A) Write a pseudo code to print all the possible permutations for the given array with duplicates using Backtracking.</p> <p>B) Draw the recursion tree for the problem.</p> <p>C) What will be the complexity of the approach followed.</p> <p>D) What will be output of the following problem.</p> <p>Input: nums[] = { 2, 1, 2 }</p>	13(5+5+2+1)																									
Q. 2	<p>Think of solution which solves problems of this kind? Recorded advertisement videos have to be packed into fixed lengths breaks. These would be telecasted on the television. The playback time (mins) of 8 advertisements are given to be A(10), B(14), C(1), D(13), E(7), F(2), G(5), H(6). The break duration is a constant time of 15 mins.</p> <p>a. Calculate the minimum number of breaks to pack these advertisements using brute force method?</p> <p>b. Apply First Fit, Best Fit and First Fit Decreasing and find the pattern of allocating the advertisements to different breaks?</p> <p>c. Identify the method which plays advertisement G earlier, and also identify the one which plays together the advertisements D and F.</p>	6(1+4+1)																									
Q. 3	<p>Solve the graph given below using TSP-BB technique and find the optimal path from A to C (Run the TSP-BB for one iteration only). Draw the state space tree. Follow the reduction procedure and write the upper bound values obtained for each node.</p> <table border="1"><tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td></tr><tr><td>A</td><td>∞</td><td>2</td><td>∞</td><td>1</td></tr><tr><td>B</td><td>2</td><td>∞</td><td>2</td><td>3</td></tr><tr><td>C</td><td>∞</td><td>2</td><td>∞</td><td>4</td></tr><tr><td>D</td><td>1</td><td>3</td><td>4</td><td>∞</td></tr></table> 		A	B	C	D	A	∞	2	∞	1	B	2	∞	2	3	C	∞	2	∞	4	D	1	3	4	∞	8
	A	B	C	D																							
A	∞	2	∞	1																							
B	2	∞	2	3																							
C	∞	2	∞	4																							
D	1	3	4	∞																							

Q. 4 Consider the following graph. Here source is node a and sink node is g.

7(3+4)



- Nodes are partitioned into two sets which are $A=\{a,b,c,d\}$ and $B=\{e,f,g\}$. Compute the capacity of this cut $C(A,B)$?
- Consider a path $a-c-d-e-f-g$. Find the bottleneck for this path then using the bottleneck as the flow on each of edges on the path $(a-c-d-e-f-g)$ draw the residual graph.

Q. 5 Consider a **matrix** with size MXN containing integer values. Write the non-deterministic algorithm to sort each row in ascending order.

6

Example:

Input:

2	-1	11
25	13	4
41	101	31

Output:

-1	2	11
4	13	25
31	41	101

***** ALL THE BEST *****

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DEPARTMENT OF COMPUTER SCIENCE**

**Questions: 5
Pages: 2
SET B**

COURSE : Design and Analysis of Algorithms (CS F364)

COMPONENT : Test -2 (Open Book)

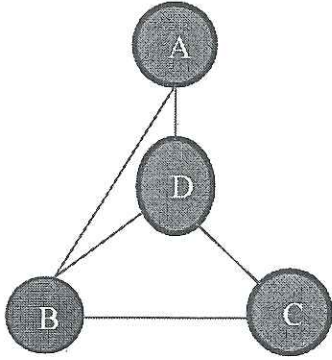
WEIGHTAGE : 20% (40 Marks)

DATE : 20-Apr-2021, T2

DURATION : 50 Minutes (08:30 am - 09:20 am)

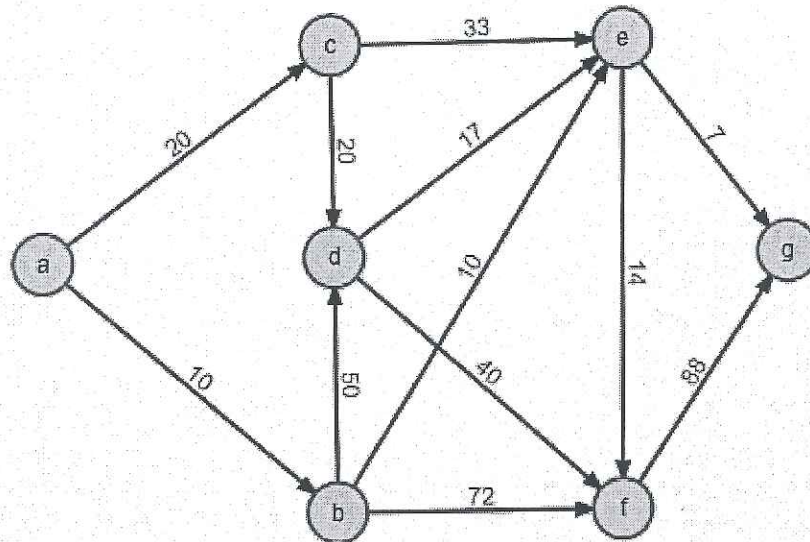
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Submissions beyond 09:25 am will not be accepted.

Q. 1	<p>A)Write a pseudo code to print all the possible permutations for the given array using Backtracking.</p> <p>B)Draw the state space tree for the problem.</p> <p>C)What will be the complexity of the approach suggested?</p> <p>D)What will be output of the following problem.</p> <p>Input: nums[] = { 3, 2, 1 }</p>	13(5+5+2+1)																									
Q. 2	<p>Think of solution which solves problems of this kind? Recorded advertisement videos have to be packed into fixed lengths breaks. These would be telecasted on the television. The playback time (mins) of 8 advertisements are given to be A(11), B(13), C(2), D(13), E(6), F(2), G(8), H(3). The break duration is a constant time of 15 mins.</p> <p>a. Calculate the minimum number of breaks to pack these advertisements using brute force method?</p> <p>b. Apply First Fit, Best Fit and First Fit Decreasing and find the pattern of allocating the advertisements to different breaks?</p> <p>c. Identify the method which plays advertisement G earlier, and also identify the one which plays together the advertisements D and F.</p>	6(1+4+1)																									
Q. 3	<p>Solve the graph given below using TSP-BB technique and find the optimal path from A to C (Run the TSP-BB for one iteration only). Draw the state space tree. Follow the reduction procedure and write the upper bound values obtained for each node.</p> <table border="1"><tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td></tr><tr><td>A</td><td>∞</td><td>3</td><td>∞</td><td>2</td></tr><tr><td>B</td><td>3</td><td>∞</td><td>3</td><td>4</td></tr><tr><td>C</td><td>∞</td><td>3</td><td>∞</td><td>5</td></tr><tr><td>D</td><td>2</td><td>4</td><td>5</td><td>∞</td></tr></table> 		A	B	C	D	A	∞	3	∞	2	B	3	∞	3	4	C	∞	3	∞	5	D	2	4	5	∞	8
	A	B	C	D																							
A	∞	3	∞	2																							
B	3	∞	3	4																							
C	∞	3	∞	5																							
D	2	4	5	∞																							

Q. 4 Consider the following graph. Here source is node a and sink node is g.

7(3+4)



- Nodes are partitioned into two sets which are $A=\{a,c,e,d\}$ and $B=\{b,f,g\}$. Compute the capacity of this cut $C(A,B)$?
- Consider a path $a-b-d-e-g$. Find the bottleneck for this path then using the bottleneck as the flow on each of edges on the path $(a-b-d-e-g)$ draw the residual graph.

Q. 5 Consider a **matrix** with size $M \times N$ containing integer values. Write the non-deterministic algorithm to sort each row in descending order.

6

Example:

Input:

2	-1	11
25	13	4
41	101	31

Output:

11	2	-1
25	13	4
101	41	31

***** ALL THE BEST *****

**DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI
SECOND SEMESTER 2020 – 2021
ACADEMIC-UNDERGRADUATE STUDIES DIVISION
DEPARTMENT OF COMPUTER SCIENCE**

**Questions: 3
Pages: 2**

COURSE : Design and Analysis of Algorithms (CS F364)

COMPONENT : COMPRE EXAM- SET A -

WEIGHTAGE : 13.5% (27 Marks)

SECTION 1(Open Book)

DATE : 02-June-2021 -AN

DURATION : (50 mins) 12:30 PM – 01:20 PM

Note: Scan and upload only between 01:20 PM – 01:25 PM

Submissions beyond 01:25 PM will not be accepted.

<p>Q.1</p>	<p>Assume there are A machines. B jobs are executed on A machines and $B=2*A+1$. Each job is of length as given in the sequence ($2*A-1$, $2*A-1$, $2*A-2$, $2*A-2$, $2*A-3$, $2*A-3$, ..., A, A) and the very last job is of length A again.</p> <p>a. Apply Longest Processing Time by taking A value as 6 and calculate the finish time $\rightarrow (F^*(I))$ b. Applying brute force find the optimal solution and calculate the finish time $\rightarrow (F^*(I))$ c. Prove that $\frac{4}{3} - \frac{1}{3*A} \geq \frac{F^*(I)}{F(I)}$</p>	<p>10 (4+4+2)</p>
<p>Q.2</p>	<p>Given four cities A, B, C and D. Apply the Branch and Bound approach to find the shortest path from source node B to destination node B. Follow the principles of Travelling salesman problem.</p> <p>1. Draw the state space tree for one complete iteration. Derive the upper bound values for each node in the traversing path and mention the same in the state space tree.</p> <p>2. Write the path obtained after first iteration. What is the cost of the path.</p> <p>3. How would you proceed, if you come to know that the path you obtained in the first iteration is not the shortest path?</p> <div data-bbox="606 1366 1308 1859"> </div>	<p>10 (6+4)</p>

Q.3	<p>Multithreading plays a major role in parallel computing.</p> <p>1. Assume you frame a recursive Algorithm A for a problem P and its Directed Acyclic Graph (DAG) is drawn. The total time taken to execute 'A' in one processor is 20 time units. The longest path in the DAG is 8 time units. Calculate the parallelism. Also, calculate the parallel slackness using 2 processors. Compare and contrast the slackness value vs perfect linear speedup.</p> <p>2. Assume you frame a different recursive Algorithm B for a same problem P and its Directed Acyclic Graph (DAG) is drawn. The total time taken to execute 'B' in one processor is 24 time units. The longest path in the DAG is 12 time units. Calculate the parallelism. Also, calculate the parallel slackness using 2 processors. Compare and contrast the slackness value vs perfect linear speedup.</p> <p>3. Justify the algorithm A or B, which you prefer and mention why?</p>	<p>7 (2.5+ 2.5+2)</p>
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**Questions: 3
Pages: 2**

COURSE : Design and Analysis of Algorithms (CS F364)

COMPONENT : COMPRE EXAM- SET A -

WEIGHTAGE : 13.5% (27 Marks)

SECTION 2(Open Book)

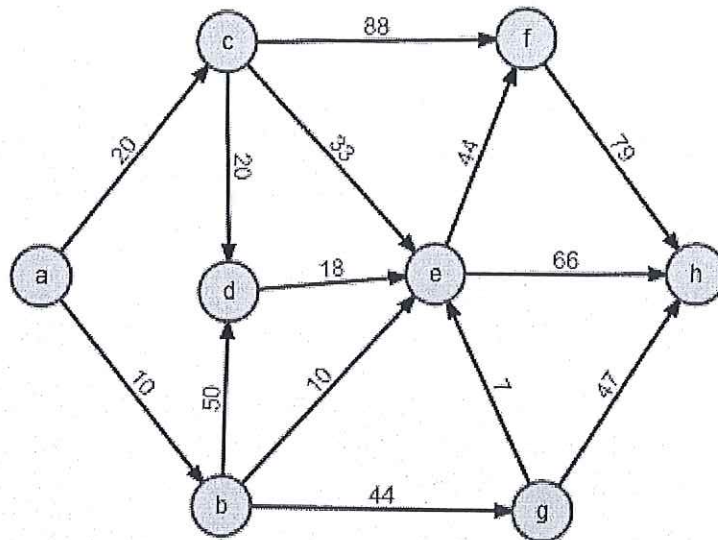
DATE : 02-June-2021 -AN

DURATION : (55 mins) 01:30 PM – 02:25 PM

Note: Scan and upload only between 02:25 PM – 02:30 PM

Submissions beyond 02:30 PM will not be accepted.

Q.1	<p>Consider the following objective function and constraints</p> <p>Minimization $x_1 - 10x_2 + 13x_3$</p> <p>Constraints</p> $-2x_1 - 12x_2 \geq -4$ $23x_1 - 2x_3 \leq 15$ $6x_1 + 12x_2 \geq -3$ $x_1, x_2, x_3 \geq 0$ <p>i. Convert the above linear optimization problem to standard form</p> <p>ii. Represent the linear optimization problem into slack form</p> <p>iii. Provide the basic solution and value of each variable for basic solution</p> <p>iv. Consider variable x_2. Perform exchange (pivot) operation of exchanging the role of non-basic to basic variable for x_2. what is the objective value after this operation?</p>	10(2+2+2+4)
Q.2	<p>In the proof of CNF-satisfiability reduces to clique decision problem, provide the details with suitable notation and equations how to make graph from a CNF. Construct the graph representation for the CNF and write at least two cliques from this graph.</p> $F = (X_1 \vee \overline{X_3}) \wedge (X_2 \vee \overline{X_4}) \wedge (X_2 \vee \overline{X_3} \vee X_4)$	7(2+3+2)
Q.3	<p>Consider the following network. In this network node 'a' is source and node 'h' is the sink.</p>	10(4+2+4)



- Construct a path such that it not passing through node d and node e with minimum flow 10. Write the residual graph for this path.
- Consider two sets $A=\{a,b,g\}$ and $B=\{c,d,e,f,h\}$ what is the capacity of this cut?
- Consider node e. The inflow from each incoming edge to e are
 - (c,e) flow is 12
 - (d,e) flow is 9
 - (b,e) flow is 10
 - (g,e) flow is 6

The outflow from each edges are:

- (e,f) flow is 20
- (e,h) flow is 26

Is conservation condition satisfied at the node e? if not adjust the new values for outgoing flow to satisfy conservation condition.

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**Questions: 3
Pages: 2**

COURSE : Design and Analysis of Algorithms (CS F364)

COMPONENT : COMPRE EXAM- SET A -

WEIGHTAGE : 13% (26 Marks)

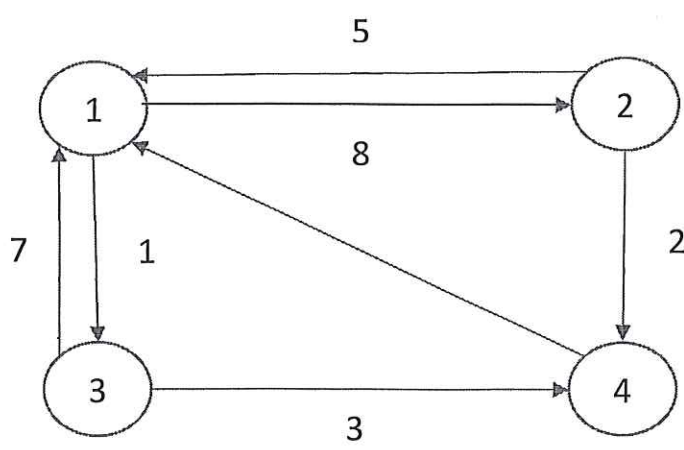
SECTION 3(Open Book)

DATE : 02-June-2021 -AN

DURATION : (50 mins) 02:35 PM -03:25 PM

Note: Scan and upload only between 03:25 PM – 03:30 PM

Submissions beyond 03:30 PM will not be accepted.

<p>Q. 1</p>	<p>Assume the partition in the quick sort is done on the basis of second last element of the given input below. Assume, there are n distinct elements from the set $[1 \dots n]$ which needs to be sorted. The input to this example is 10, 3, 5, 9, 14, 4.</p> <p>A) What is the complexity of the problem in big 'O' notation. B) Derive the recurrence relation of the above problem. C) Write the complete working of all the iterations in the quick sort including the pivot element and array obtained with the input given.</p>	<p>8(2+1+5)</p>
<p>Q.2</p>	<p>There is a set of 4 non-negative integers (x_1, x_2, x_3, and x_4) and variable Y. The non-negative integers are single-digit prime number. The task is to determine whether there exists a subset of the given set sum equal to a given variable Y. Here the value of the variable Y is 8.</p> <p>A) Identify the value for non-negative integers (x_1, x_2, x_3, and x_4). B) Solve the problem using back tracking technique. Show the state space tree for the values identified in part (a). C) Write the algorithm for approach to solve this problem.</p>	<p>9(3+3+3)</p>
<p>Q3.</p>	<p>Consider the graph given below:</p> 	<p>9(2+2+5)</p>

- | | | |
|--|---|--|
| | <p>A) Write the initial cost matrix.</p> <p>B) What is the complexity of the all pair shortest path algorithm.</p> <p>C) and show the results along with the complete steps how the values are computed for all the iterations till A^4.</p> | |
|--|---|--|

Each step carries marks, so please mention all the steps how results has been computed.

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**Questions: 3
Pages: 2**

COURSE : Design and Analysis of Algorithms (CS F364)

COMPONENT : COMPRE EXAM-SET B -

WEIGHTAGE : 13.5% (27 Marks)

SECTION 1(Open Book)

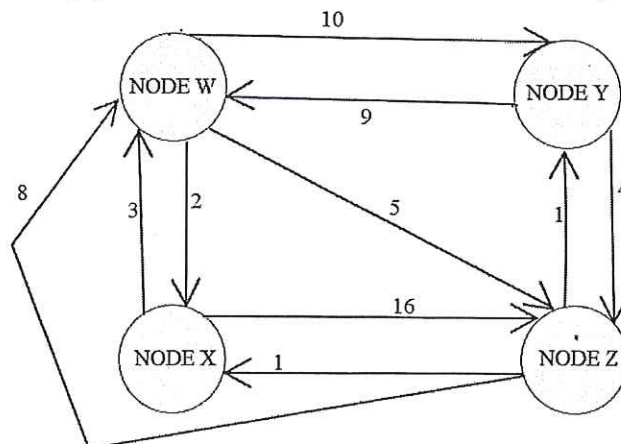
DATE : 02-June-2021 -AN

DURATION : 50 Minutes (12:30 PM - 01:20 PM)

Note: Scan and upload only between 01:20 PM – 01:25 PM

Submissions beyond 01:25 PM will not be accepted.

<p>Q. 1</p>	<p>Assume there are X machines. Y jobs are executed on X machines and $Y=2*X+1$. Each job is of length as given in the sequence $(2*X-1, 2*X-1, 2*X-2, 2*X-2, 2*X-3, 2*X-3, \dots, X, X)$ and the very last job is of length X again.</p> <p>a. Apply Longest Processing Time by taking X value as 7 and calculate the finish time $\rightarrow (F^*(I))$ b. Applying brute force find the optimal solution and calculate the finish time $\rightarrow (F^*(I))$ c. Prove that $\frac{4}{3} - \frac{1}{3*A} \geq \frac{F^*(I)}{F^*(I)}$</p>	<p>10 (4+4+2)</p>
<p>Q. 2</p>	<p>Given nodes W, X, Y and Z. Apply the Branch and Bound approach to find the shortest path from source node X to destination node X. Follow the principles of Travelling salesman problem.</p> <p>1. Draw the state space tree for one complete iteration. Derive the upper bound values for each node in the traversing path and mention the same in the state space tree.</p> <p>2. Write the path obtained after first iteration. What is the cost of the path.</p> <p>3. How would you proceed, if you come to know that the path you obtained in the first iteration is not the shortest path?</p>	<p>10 (6+4)</p>



Q. 3	<p>Multithreading plays a major role in parallel computing.</p> <p>1. Assume you frame a recursive Algorithm A for a problem P and its Directed Acyclic Graph (DAG) is drawn. The total time taken to execute 'A' in one processor is 40 time units. The longest path in the DAG is 20 time units. Calculate the parallelism. Also the parallel slackness using 2 processors. Compare and contrast the slackness value vs perfect linear speedup.</p> <p>2. Assume you frame a different recursive Algorithm B for a same problem P and its Directed Acyclic Graph (DAG) is drawn. The total time taken to execute 'B' in one processor is 48 time units. The longest path in the DAG is 22 time units. Calculate the parallelism. Also the parallel slackness using 2 processors. Compare and contrast the slackness value vs perfect linear speedup.</p> <p>3. Justify the algorithm which you prefer and mention why?</p>	<p>7 (2.5+2.5+2)</p>
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**Questions: 3
Pages: 2**

COURSE : Design and Analysis of Algorithms (CS F364)

COMPONENT : COMPRE EXAM- SET B -

WEIGHTAGE : 13.5% (27 Marks)

SECTION 2(Open Book)

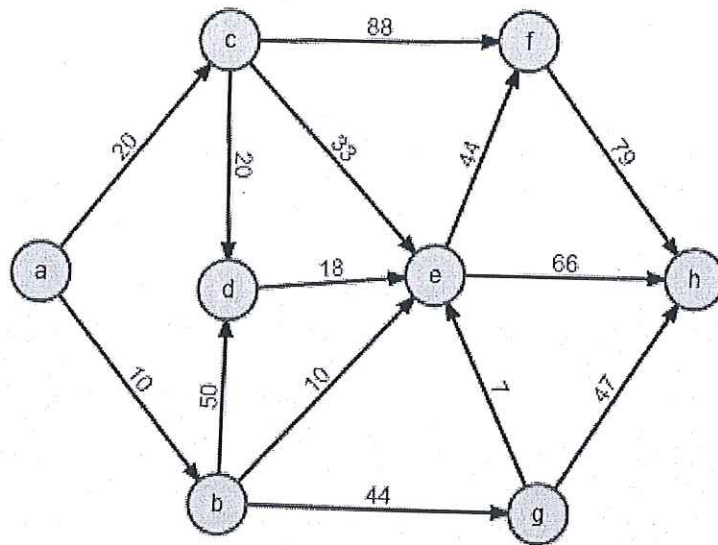
DATE : 02-June-2021 -AN

DURATION : (55 mins) 01:30 PM – 02:25 PM

Note: Scan and upload only between 02:25 PM – 02:30 PM

Submissions beyond 02:30 PM will not be accepted.

Q. 1	<p>1. Consider the following objective function and constraints</p> <p>Minimization $10x_1 - x_2 - 23x_3$</p> <p>Constraints</p> $4x_1 + 13x_2 \geq -14$ $2x_1 - 22x_3 \leq 5$ $15x_1 - 7x_2 \geq -21$ $x_1, x_2, x_3 \geq 0$ <p>i. Convert the above linear optimization problem to standard form</p> <p>ii. Represent the linear optimization problem into slack form</p> <p>iii. Provide the basic solution and value of each variable for basic solution</p> <p>iv. Consider variable x_2. Perform exchange (pivot) operation of exchanging the role of non-basic to basic variable for x_2. what is the objective value after this operation?</p>	10(2+2+2+4)
Q.2	<p>In the proof that CNF-satisfiability reduces to clique decision problem, provide the details with suitable notation and equations how to make graph from a CNF. Construct the graph representation for the CNF and write at least two cliques from this graph.</p> $F = (X_1 \vee \overline{X_2}) \wedge (\overline{X_1} \vee X_3) \wedge (X_1 \vee X_2 \vee \overline{X_3})$	7(2+3+2)
Q. 3	<p>Consider the following network. In this network node 'a' is source and node 'h' is the sink.</p>	10(4+2+4)



- a. Consider the path (a—c—d—e—h) with flow 18. Write the residual graph for this path.
- b. Consider two sets $A = \{a, c, d, e\}$ and $b = \{b, f, g, h\}$ what is the capacity of this cut?
- c. Consider node e. The inflow from each incoming edge to e are
 - i. (c,e) flow is 10
 - ii. (d,e) flow is 7
 - iii. (b,e) flow is 6
 - iv. (g,e) flow is 4

The outflow from each edges are:

- v. (e,f) flow is 17
- vi. (e,h) flow is 13

Is conservation condition satisfied at the node e? if not adjust the new values for outgoing flow to satisfy conservation condition.

**DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI
SECOND SEMESTER 2020 – 2021
ACADEMIC-UNDERGRADUATE STUDIES DIVISION
DEPARTMENT OF COMPUTER SCIENCE**

**Questions: 3
Pages: 2**

COURSE : Design and Analysis of Algorithms (CS F364)

COMPONENT : COMPRE EXAM- SET B –

WEIGHTAGE : 13% (26 Marks)

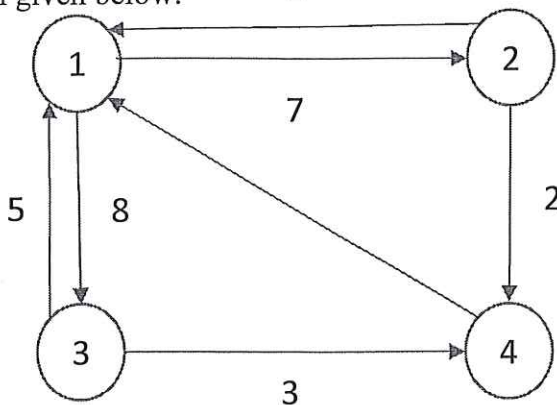
SECTION 3 (Open Book)

DATE : 02-June-2021 -AN

DURATION : (50 mins)02:35 PM -03:25 PM

Note: Scan and upload only between 03:25 PM – 03:30 PM

Submissions beyond 03:30 PM will not be accepted.

Q. 1	<p>Assume the partition in the quick sort is done on the basis of second last element of the given input below. Assume, there are n distinct elements from the set $[1 \dots n]$ which needs to be sorted. The input to this example is 11, 4, 6, 10, 15, 5.</p> <p>A) What is the complexity of the problem in big 'O' notation. B) Derive the recurrence relation of the above problem. C) Write the complete working of all the iterations in the quick sort including the pivot element and array obtained with the input given.</p>	8(2+1+5)
Q.2	<p>There is a set of 4 non-negative integers (x_1, x_2, x_3, x_4) and variable Y. The non-negative integers are first four double-digit prime number less than 20. The task is to determine whether there exists a subset of the given set sum equal to given variable Y.</p> <p>Here the value of the variable Y is 30.</p> <p>A) Identify the value for non-negative integers (x_1, x_2, x_3, and x_4). B) Solve the problem using back tracking technique. Show the state space tree for the values identified in part (a). C) Write the algorithm for approach to solve this problem.</p>	9(3+3+3)
Q3.	<p>Consider the graph given below:</p> 	9(2+2+5)

- | | | |
|--|--|--|
| | <ul style="list-style-type: none">A) Write the initial cost matrix.B) What is the complexity of the all pair shortest path algorithm.C) and show the results along with the complete steps how the values are computed for all the iterations till A^4. | |
|--|--|--|

Each step carries marks, so please mention all the steps how results has been computed.