



Virtual University

About Us

CS502  
Solved Final Term Paper 3

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Year  
2017

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

In the Name of Allāh, the Most Gracious, the Most Merciful

### Paper Pattern

MCQS 40 each 1 mark  
Short 4 each 2 marks  
Short 4 each 3 marks  
long 4 each 5 marks

Question No : 1 of 52

Marks: 1 (Budgeted Time 1 Min)

An optimization problem is one in which you want to find,

Answer ( Please select your correct option )

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☒ Not a solution

☐ An algorithm

☐ Good solution

☒ The best solution

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Question No : 2 of 52

Marks: 1 (Budgeted Time 1 Min)

Suppose that a graph  $G = (V, E)$  is implemented using adjacency lists. What is the complexity of a breadth-first traversal of  $G$ ?

adjacency list requires  $\Theta(n + e)$  storage  
page 116

Answer ( Please select your correct option )

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☐  $O(|V|)$

☐  $O(|V| + |E|)$

☐  $O(|V| + |E|)$

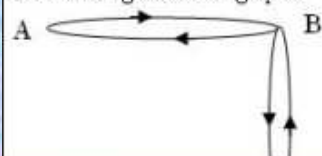
☒  $O(|V| + |E|)$

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Question No : 3 of 52

Marks: 1 (Budgeted Time 1 Min)

The total degrees of the graph is



Answer ( Please select your correct option )

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3

5

6

9

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Question No : 3 of 52

Marks: 1 (Budgeted Time 1 Min)



Answer ( Please select your correct option )

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3

5

6

9

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Question No : 3 of 52

Marks: 1 (Budgeted Time 1 Min)



Answer ( Please select your correct option )

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3

5

6

9

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Question No : 4 of 52

Marks: 1 (Budgeted Time 1 Min)

Non-optimal or greedy algorithm for money change takes \_\_\_\_\_

Answer ( Please select your correct option )

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☒  $O(k)$

ref moazz

☐  $O(2^k)$

☐  $O(N)$

☐  $O(kN)$

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Question No : 5 of 52

Marks: 1 (Budgeted Time 1 Min)

The Huffman algorithm finds a (n) \_\_\_\_\_ solution.

Answer ( Please select your correct option )

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☒ Optimal

p 102

☐ Non-optimal

☐ Exponential

☐ Polynomial

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Question No : 6 of 52

Marks: 1 (Budgeted Time 1 Min)

Which formula is used for calculating worst case running time?

Answer ( Please select your correct option )

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☒  $T_{worst}(n) = \max_{1 \leq i \leq n} T(i)$

p 13

☐  $T_{worst}(n) = \max_{1 \leq i \leq n} T(i)$

☐  $T_{worst}(n) = \max_{1 \leq i \leq n} T(n)$

☐  $T_{worst}(n) = \max_{1 \leq i \leq n} T(n)$

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Question No : 7 of 52

Marks: 1 (Budgeted Time 1 Min)

The reason for introducing Sieve Technique algorithm is that it illustrates a very important special case of,

Answer ( Please select your correct option )

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☒ divide-and-conquer p 34

☐ decrease and conquer

☐ greedy nature

☐ 2-dimension Maxima

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Question No : 8 of 52

Marks: 1 (Budgeted Time 1 Min)

Sieve Technique applies to problems where we are interested in finding a single item from a larger set of \_\_\_\_\_

Answer ( Please select your correct option )

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☒ n items p 34

☐ phases

☐ pointers

☐ constant

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Question No : 9 of 52

Marks: 1 (Budgeted Time 1 Min)

The number of nodes in a complete binary tree of height h is

Answer ( Please select your correct option )

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☒  $2^{(h+1)} - 1$  p 40

☐  $2 * (h+1) - 1$

☐  $2 * (h+1)$

☐  $((h+1) ^ 2) - 1$

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Question No : 10 of 52

Marks: 1 (Budgeted Time 1 Min)

If there are  $\Theta(n^2)$  entries in edit distance matrix then the total running time is

Answer ( Please select your correct option )

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- ☐  $\Theta(1)$
- ☒  $\Theta(n^2)$  ref moazz files
- ☐  $\Theta(n)$
- ☐  $\Theta(n \log n)$

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Question No : 11 of 52

Marks: 1 (Budgeted Time 1 Min)

When a recursive algorithm revisits the same problem over and over again, we say that the optimization problem has \_\_\_\_\_ sub-problems.

Answer ( Please select your correct option )

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- ☐ Overlapping
- ☐ Over costing
- ☐ Optimized
- ☒ None of these not sure

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Question No : 12 of 52

Marks: 1 (Budgeted Time 1 Min)

A  $p \times q$  matrix A can be multiplied with a  $q \times r$  matrix B. The result will be a  $p \times r$  matrix C. There are  $(p \cdot r)$  total entries in C and each takes \_\_\_\_\_ to compute.

Answer ( Please select your correct option )

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- ☒  $O(q)$  p 84
- ☐  $O(1)$
- ☐  $O(n^2)$
- ☐  $O(n^3)$

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Question No : 13 of 52

Marks: 1 (Budgeted Time 1 Min)

Matrix – Chain – Order is \_\_\_\_\_ than the exponential time method of enumerating all possible parenthesizations and checking each one.

Answer ( Please select your correct option )

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- ☐ Much more efficient
- ☐ Only fractional efficient
- ☐ Worst
- ☐ Too slow

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Question No : 14 of 52

Marks: 1 (Budgeted Time 1 Min)

The recurrence relation of Tower of Hanoi is given below

$$T(n) = \begin{cases} 1 & \text{if } n=1 \\ 2T(n-1) + 1 & \text{if } n > 1 \end{cases}$$

In order to move a tower of 4 rings from one peg to another, how many ring moves are required?

Answer ( Please select your correct option )

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- ☐ 15
- ☐ 7
- ☐ 12
- ☒ 32

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Question No : 15 of 52

Marks: 1 (Budgeted Time 1 Min)

Maximum number of edges in a Directed Graph may be

Answer ( Please select your correct option )

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- ☐ V
- ☐ 2V
- ☒ Approximately  $|V|^2$
- ☐  $V/2$

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Question No : 16 of 52

Marks: 1 (Budgeted Time 1 Min)

An adjacency matrix for a graph

Answer ( Please select your correct option )

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- ☐ always square in shape
- ☒ It is not necessary for it to be square in shape
- ☐ not sure
- ☐ Is square in shape for directed graphs but not for undirected graphs
- ☐ Is always diagonal matrix

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Question No : 17 of 52

Marks: 1 (Budgeted Time 1 Min)

Using ASCII standard the string "ab-#\$c" will be encoded \_\_\_\_\_ bytes

Answer ( Please select your correct option )

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- ☐ 16
- ☐ 7
- ☐ 6
- ☒ This string cannot be stored using ASCII standard

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Question No : 18 of 52

Marks: 1 (Budgeted Time 1 Min)

Using Huffman encoding technique the string "a@f#a" will be encoded with \_\_\_\_\_ bits

Answer ( Please select your correct option )

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- ☐ 5
- ☐ 6
- ☐ 8
- ☒ Huffman encoding fail at this string

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Question No : 19 of 52

Marks: 1 (Budgeted Time 1 Min)

In fractional knapsack we sort the

Answer ( Please select your correct option )

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☒ Value per unit weight in decreasing order

p 109

☐ Weight per unit value in decreasing order

☐ Value per unit weight in increasing order

☐ Weight per unit value in increasing order

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Question No : 20 of 52

Marks: 1 (Budgeted Time 1 Min)

The greedy part of the Huffman encoding algorithm is to first find two nodes with \_\_\_\_\_ frequency.

Answer ( Please select your correct option )

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☐ Larger

☒ Smallest

p 100

☐ Balance

☐ Character

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Question No : 21 of 52

Marks: 1 (Budgeted Time 1 Min)

The codeword assigned to characters by the Huffman algorithm have the property

Answer ( Please select your correct option )

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☒ that no codeword is the prefix of any other

p 101

☐ that no codeword is the postfix of any other

☐ that no codeword is the infix of any other

☐ that no codeword is neither prefix nor postfix of any other

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Question No : 22 of 52

Marks: 1 (Budgeted Time 1 Min)

In undirected graphs there

Answer ( Please select your correct option )

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- ☐ are no Cross edges but have forward and back edges
- ☐ are only forward edges
- ☒ is convention of only back edges
- ☐ is convention of forward edges

p 130

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Question No : 23 of 52

Marks: 1 (Budgeted Time 1 Min)

In time stamp DFS for the edge  $(u,v)$  if  $f(u) > f(v)$  then

Answer ( Please select your correct option )

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- ☐ the edge is cross
- ☐ the edge is back
- ☐ the edge is forward
- ☒ the edge is tree or cross or forward

p 130

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Question No : 24 of 52

Marks: 1 (Budgeted Time 1 Min)

Kruskal's algorithm

Answer ( Please select your correct option )

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- ☒ Choose the best non-cycle edge
- ☐ Choose the best tree edge
- ☐ Choose the vertex that gives the lightest weight
- ☐ Follow the dynamic programming rules for choosing edges

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Question No : 25 of 52

Marks: 1 (Budgeted Time 1 Min)

In Prim's algorithm we use

Answer ( Please select your correct option )

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- ☐ Queue data structure
- ☒ Priority Queue data structure
- ☐ Stack data structure
- ☐ Both stack and Queue data structures

p 150

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Question No : 26 of 52

Marks: 1 (Budgeted Time 1 Min)

Adding any edge to a free tree

Answer ( Please select your correct option )

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- ☐ keeps it the free tree and increases the size of the tree
- ☒ creates a unique cycle
- ☐ it is not allowed to add the edge in free tree
- ☐ creates multiple cycles

p 142

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Question No : 27 of 52

Marks: 1 (Budgeted Time 1 Min)

Floyd-Warshall algorithm is

Answer ( Please select your correct option )

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- ☐ based on greedy approach and allow negative edges
- ☐ based on divide and conquer approach and allow negative edges
- ☐ based on dynamic programming approach and allow negative cycles
- ☒ based on dynamic programming approach and allow negative edges

p 161

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Question No : 28 of 52

Marks: 1 (Budgeted Time 1 Min)

Dijkstra's algorithm is used for

Answer ( Please select your correct option )

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- ☐ calculating multiple source shortest path problems
- ☐ calculating Minimum spanning tree
- ☐ shortest and Minimum Spanning tree both can be calculated by it
- ☒ single source shortest path problems

p 154

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Question No : 29 of 52

Marks: 1 (Budgeted Time 1 Min)

Bellman Ford algorithm applies relaxation to every

Answer ( Please select your correct option )

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- ☒ edge of the graph and repeats exactly  $v-1$  times
- ☐ vertex of the graph and repeats exactly  $E-1$  times
- ☐ edge of the graph and repeats exactly  $E-1$  times
- ☐ edge but use the back edges for the completion

p 160

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Question No : 30 of 52

Marks: 1 (Budgeted Time 1 Min)

Complexity wise the comparison based merge and quick sort algorithms fall in

Answer ( Please select your correct option )

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- ☐ Deterministic Polynomial class
- ☐ Non-Deterministic Polynomial class
- ☐ Quick sort in P class and Merge sort in NP class
- ☐ Quick sort in NP class and Merge sort in P class

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Question No : 31 of 52

Marks: 1 (Budgeted Time 1 Min)

Running time of Floyd-Warshall algorithm is

Answer ( Please select your correct option )

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- ☐  $\Theta(n^2)$
- ☐  $\Theta(n^4)$
- ☒  $\Theta(n^3)$  p 161
- ☐  $\Theta(3^n)$

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Question No : 32 of 52

Marks: 1 (Budgeted Time 1 Min)

If we can solve a single NP problem in P time

Answer ( Please select your correct option )

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- ☒ All NP-problems can be solved p 173
- ☐ All P problems can be solved
- ☐ We cannot predict about the solution of other NP problems
- ☐ This can be never possible to solve the NP problem in P time

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Question No : 33 of 52

Marks: 1 (Budgeted Time 1 Min)

If a problem is NP-complete

Answer ( Please select your correct option )

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- ☐ it must be in P
- ☒ it must also be in NP
- ☐ there is no relation between NP and NP-complete
- ☐ it can be solved in P time

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Question No : 34 of 52

Marks: 1 (Budgeted Time 1 Min)

3-color problem is known as \_\_\_\_\_

Answer ( Please select your correct option )

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P

☒ NPC

p 173

Co-NP

P and NP

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Question No : 35 of 52

Marks: 1 (Budgeted Time 1 Min)

Clique cover problem arises in applications of \_\_\_\_\_

Answer ( Please select your correct option )

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Map drawing

☒ Clustering

p 176

Architectural design

Clique

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Question No : 36 of 52

Marks: 1 (Budgeted Time 1 Min)

In the 3-coloring problem, for two vertices to be in the same group, they must be not \_\_\_\_\_ to each other.

Answer ( Please select your correct option )

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Apart from

Far from

Near to

☒ Adjacent to

p 176

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Question No : 37 of 52

Marks: 1 (Budgeted Time 1 Min)

What is the worst-case time for merge sort to sort an array of  $n$  elements?

Answer ( Please select your correct option )

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☒  $O(n \log n)$

☐  $O(n^2)$

☐  $O(\log n)$

☐  $O(n)$

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Question No : 38 of 52

Marks: 1 (Budgeted Time 1 Min)

Search techniques of various algorithms look at \_\_\_\_

Answer ( Please select your correct option )

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☒ Many possible solutions

p 97

☐ Maximum 2 possible solutions

☐ Minimum 2 possible solutions

☐ Sorting solutions

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Question No : 39 of 52

Marks: 1 (Budgeted Time 1 Min)

The Huffman encoding algorithm is a \_\_\_\_

Answer ( Please select your correct option )

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☐ Dynamic and greedy algorithm

☐ Divide and conquer and greedy algorithm

☒ Greedy algorithm.

p 99

☐ Dynamic programming algorithm

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Question No : 40 of 52

Marks: 1 (Budgeted Time 1 Min)

Breadth first search is shortest path algorithm that works

Answer ( Please select your correct option )

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☒ on un-weighted graphs

p 153

☐ on weighted graphs

☐ on both weighted and un-weighted graphs

☐ BFS cannot be used for shortest path problems

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Question No : 41 of 52

Marks: 2 (Budgeted Time 4 Min)

What are the essential elements of an algorithm?

Answer ( Please click here to Add Answer )

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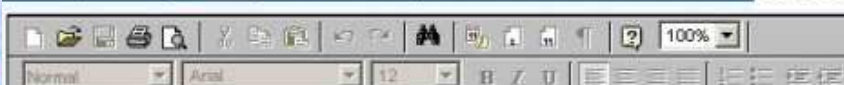
Question No : 42 of 52

Marks: 2 (Budgeted Time 4 Min)

What is overall time for Kruskal's algorithm if the graph is sparse?

Answer ( Please click here to Add Answer )

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Question No : 43 of 52

Marks: 2 (Budgeted Time 4 Min)

What is DFS and how does it work?

Answer ( Please [click here](#) to Add Answer )

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Question No : 44 of 52

Marks: 2 (Budgeted Time 4 Min)

What is Bellman-Ford algorithm's running time?

Answer ( Please [click here](#) to Add Answer )

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Question No : 45 of 52

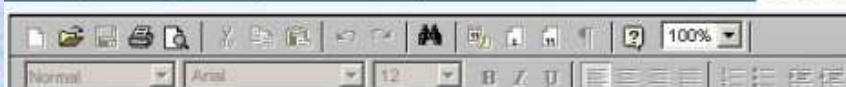
Marks: 3 (Budgeted Time 6 Min)

Explain the following two basic cases according to Floyd-Warshall Algorithm,

1. Don't go through vertex k at all.
2. Do go through vertex k.

Answer ( Please [click here](#) to Add Answer )

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Question No : 46 of 52

Marks: 3 (Budgeted Time 6 Min)

Describe 2-d maxima problem in mathematical or algorithmic form.

Answer ( [Please click here to Add Answer](#) )

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Question No : 47 of 52

Marks: 3 (Budgeted Time 6 Min)

Describe Minimum Spanning Trees Problem with examples.

Answer ( [Please click here to Add Answer](#) )

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Question No : 48 of 52

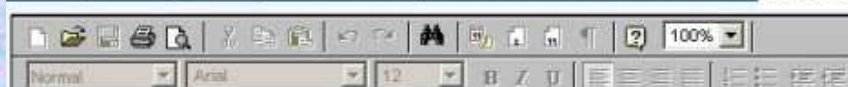
Marks: 3 (Budgeted Time 6 Min)

Let the adjacency list representation of an undirected graph is given below.  
Is there any isolated vertex? If yes, Name the vertex.  
What general property of the list indicates that the graph has an isolated vertex?

$a \rightarrow b \rightarrow c \rightarrow e$   
 $b \rightarrow a \rightarrow d$

Answer ( [Please click here to Add Answer](#) )

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$a \rightarrow b \rightarrow c \rightarrow e$   
 $b \rightarrow a \rightarrow d$   
 $c \rightarrow a \rightarrow d \rightarrow e \rightarrow f$   
 $d \rightarrow b \rightarrow c \rightarrow f$   
 $e \rightarrow a \rightarrow c \rightarrow f$

Answer ( Please [click here](#) to Add Answer )

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$b \rightarrow a \rightarrow d$   
 $c \rightarrow a \rightarrow d \rightarrow e \rightarrow f$   
 $d \rightarrow b \rightarrow c \rightarrow f$   
 $e \rightarrow a \rightarrow c \rightarrow f$   
 $f \rightarrow c \rightarrow d \rightarrow e$   
g

Answer ( Please [click here](#) to Add Answer )

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$c \rightarrow a \rightarrow d \rightarrow e \rightarrow f$   
 $d \rightarrow b \rightarrow c \rightarrow f$   
 $e \rightarrow a \rightarrow c \rightarrow f$   
 $f \rightarrow c \rightarrow d \rightarrow e$   
g

Answer ( Please [click here](#) to Add Answer )

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Question No : 49 of 52

Marks: 5 (Budgeted Time 10 Min)

You are given the task of laying down new railway lines which will connect all  $n$  cities. Thus for any pair of cities, you will end up with track connecting them. Note that two routes may share the same track; track laid between Lahore and Islamabad can be used to travel in both directions. Your goal is to use the minimum amount of track. How would you achieve the goal now? (Note : consider the scenario carefully and name only the best suited algorithm)

- 1 Dijkstra's algorithm
- 2 Prims Algorithm
- 3 Folloyed Warshal Algorithm

Answer ( Please [click here](#) to Add Answer )

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The screenshot shows a Microsoft Word window. The title bar reads "Microsoft Word - [Untitled-1].docx". The ribbon is set to the "Home" tab, with the "Font" group selected. The font face is "Normal", size is "12", and the style is "Normal". The text "Made by: Waqar Siddhu" is written in a large, bold, black, cursive font across the bottom of the page. A faint, light gray watermark is visible in the background, reading "Waqar Siddhu" in a serif font, oriented diagonally from the bottom left to the top right.

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Question No : 49 of 52

**Marks: 5 (Budgeted Time 10 Min)**

track, track laid between Lahore and Islamabad can be used to travel in both directions. Your goal is to use the minimum amount of track. How would you achieve the goal now? (Note : consider the scenario carefully and name only the best suited algorithm)

- 1 Dijkstra's algorithm
- 2 Prims Algorithm
- 3 Folloved Warshal Algorithm
- 4 Bellman Ford Algorithm.

Answer ( Please [click here](#) to Add Answer )

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Question No : 50 of 52

**Marks: 5 (Budgeted Time 10 Min)**

Show the result of time stamped DFS algorithm on the following graph. Take node E as a starting node. [You can show final result in exam software and need not to show all intermediate steps].



Answer ( Please [click here](#) to Add Answer )

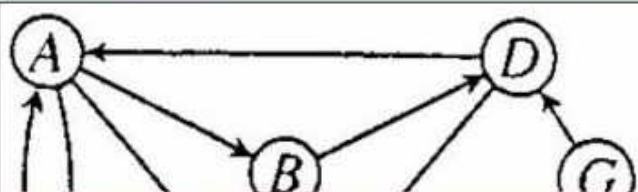
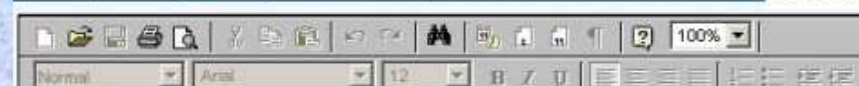
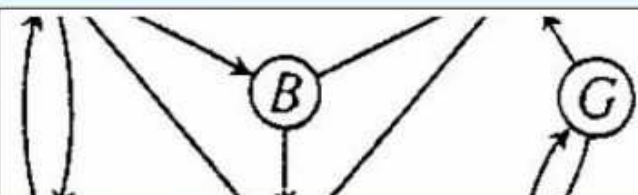
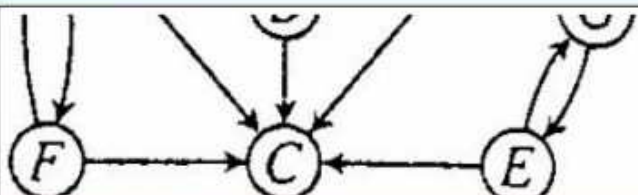
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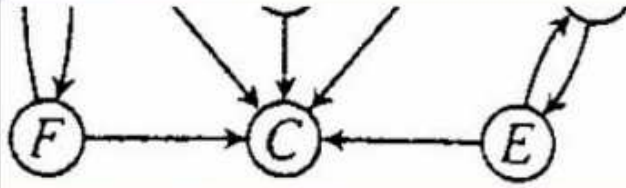
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Answer ( Please [click here](#) to Add Answer )[WWW.VirtualAcademyLive.com](http://WWW.VirtualAcademyLive.com)**Made by: Waqar Siddhu**Answer ( Please [click here](#) to Add Answer )[WWW.VirtualAcademyLive.com](http://WWW.VirtualAcademyLive.com)**Made by: Waqar Siddhu**Answer ( Please [click here](#) to Add Answer )[WWW.VirtualAcademyLive.com](http://WWW.VirtualAcademyLive.com)**Made by: Waqar Siddhu**



Answer ( Please [click here to Add Answer](#) )

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Develop the running time complexity analysis for the following piece of code. Adopt step wise approach along with asymptotic notation at the end.

```

i=1
while (i < n) {
    i++
}
for ( i=1; i <= n ; i=i*2 )

```

Answer ( Please [click here to Add Answer](#) )

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Develop the running time complexity analysis for the following piece of code. Adopt step wise approach along with asymptotic notation at the end.

```

i=1
while (i < n) {
    i++
}
for ( i=1; i <= n ; i=i*2 )
for ( j = 1; j <= i; ++j )

```

Answer ( Please [click here to Add Answer](#) )

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Question No : 52 of 52

Marks: 5 (Budgeted Time 10 Min)

Kruskal's algorithm can return different spanning trees for the same input graph  $G$  depending upon how ties are broken when edges are sorted. Prove that, for each minimum spanning tree  $T$  of  $G$ , there is a way to sort the edges of  $G$  in Kruskal's algorithm so that the algorithm returns  $T$ .

Answer ( Please [click here](#) to Add Answer )

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