MAR-April 2023

Total No. of Questions : 5]

SEAT No. :

P-3340

[Total No. of Pages : 5

[6027]-12
M.C.A. (Management)
IT-12 : DATA STRUCTURE AND ALGORITHMS
(2020 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 50*

Instructions to the candidates :

1) *All questions are compulsory.*
2) *From Q.2 to Q.5 having internal choices.*

Q1) Multiple Choice Questions : **[20 × ½ = 10]**

a) In a balance binary tree the height of two subtree of everynode can not differ by more than

i) 2 ii) 1

iii) 3 iv) 4

b) The header in linked list contain

i) First record of actual data

ii) Last record of actual data

iii) Pointer to the last record of the actual data

iv) None of these

c) What do you call the selected keys in the quick sort method?

i) Outer Key ii) Inner Key

iii) Pivot Key iv) Partition Key

d) Which method of traversal does not use stack to hold nodes that are waiting to be processed?

i) D-search ii) Breadth First

iii) Dept First iv) Back tracking

e) The knapsack problem where the objective function is to minimize the profit is _____

i) Greedy ii) Dynamic 0/1

iii) Back tracking iv) None of these

P.T.O.

f) What is the type of the algorithm used in solving the 8 Queens Problem?

i) Back tracking
ii) Dynamic
iii) Branch & Bound
iv) None of these

g) Popping is an act of

i) Adding values
ii) Taking off values from stack
iii) Transferring values from stack
iv) None

h) The optimal data structure used to solve Tower of Hanoi is _____

i) Tree
ii) Heap
iii) Priority Queue
iv) Stack

i) For a given array, there can be multiple ways to reach the end of the array using minimum number of jumps.

i) True
ii) False

j) Depth First Search is equivalent to which of the traversal in Binary trees?

i) Pre order
ii) Post order
iii) Level order
iv) In order

k) A graph in which all vertices have equal degree is known as _____.

i) Complete graph
ii) Regular graph
iii) Multi graph
iv) Simple graph

l) The time complexity of quick sort is _____.

i) O (n)
ii) O (log n)
iii) O (n^2)
iv) O (n log n)

m) To represent hierarchical between elements which data structure is suitable?

i) Dequeue
ii) Priority Queue
iii) Tree
iv) Graph

n) An algorithm in which we divide the problem into sub problem and then we combine the sub solutions to form solution to the original problem is known as _____.

i) Brute force
ii) Divide and conquer
iii) Greedy algorithm
iv) None of these

o) The complexity of linear search algorithm is _____.

i) O (n)
ii) O (log n)
iii) O (n^2)
iv) O (n log n)

p) In a Max-heap, element with greatest key is always in the which node?

i) leaf node
ii) first node of left subtree
iii) root node
iv) first node of right subtree

q) In general Backtracking can be used to solve?

i) Numerical problem
ii) Graph coloring problems
iii) Exhaustive search
iv) Combinational problem

r) In how many directions do Queens attack each other?

i) 4
ii) 3
iii) 2
iv) 1

s) If a problem can be broken into sub problems which are reused several times, the problem possesses _____ property

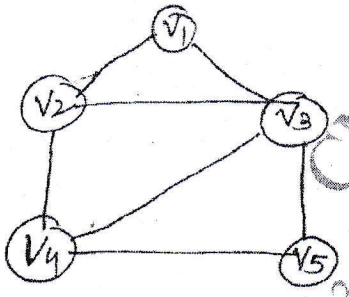
i) Overlapping subproblem
ii) Optimal substructure
iii) Memorization
iv) Greedy

t) Which of the following problems is NOT solved using Dynamic Programming?

i) 0/1 knapsack problem
ii) Matrix chain multiplication problem
iii) Edit distance problem
iv) Fractional knapsack problem

Q2) a) Draw the AVL tree for the following 4, 18, 12, 2, 3, 7, 5. **[4]**

b) Apply the DFS Algorithm to traverse the following graph **[4]**



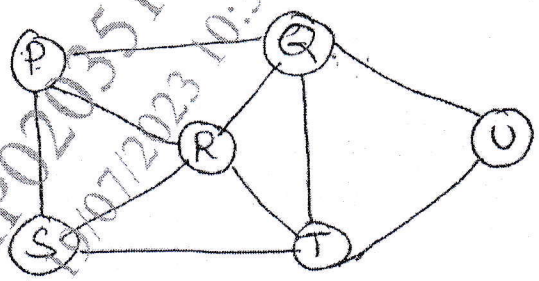
c) Explain linear probing. **[2]**

OR

a) Draw Binary Search Tree for following data. [4]

35, 89, 43, 76, 29, 55, 87, 65.

b) Apply the BFS algorithm to traverse the following graph. [4]



c) Explain Hash Table. [2]

Q3) a) Apply Recursive Staircase algorithm to following problem Input : n = 5. Draw the figure and find solution. [4]

b) Write an algorithm to implement circular queue using linked list. [4]

c) Explain Hamiltonian Cycle. [2]

OR

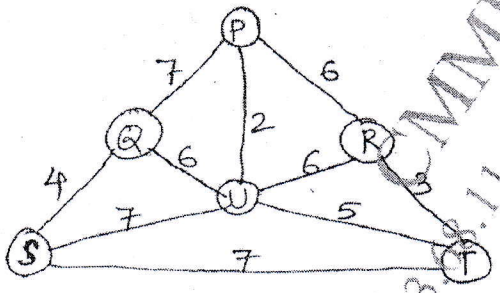
a) Apply Rain Terrace algorithm to following problem Input : [2, 3, 0, 4, 1, 5] Draw the figure and find solution. [4]

b) Write an algorithm to insert element in stack using linked list. [4]

c) Discuss combination sum. [2]

Q4) a) Sort the following data using Mergesort [22, 57, 31, 05, 99, 14, 24]. [4]

b) Apply Prim's Algorithm to obtain minimum cost spanning tree for the following graph [4]



c) Explain uses of queue. [2]

OR

a) Write an algorithm to find GCD of 44 and 17 using Euclidean algorithm. [4]

b) Write Dijkstra Algorithm. [4]

c) Discuss Double linked list. [2]

Q5) a) Find the largest common subsequence for the following string using Dynamic Programming. [7]

X = [a, b, a, a, b, a]

Y = [b, a, b, b, a, b]

b) Explain fast powering. [3]

OR

a) Consider the given instance of 0/1 knapsack problem.

N = 5, M = 11, P = (1, 6, 18, 22, 28), W = (1, 2, 5, 6, 7)

Using dynamic programming determine the optimal profit and the solution vector. [7]

b) Explain unique path with suitable example. [3]

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