Total No. of Questions : 5]
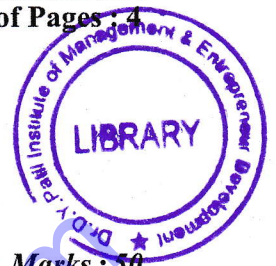
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SEAT No. :

[Total No. of Pages : 4

[5865]-102

First Year 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 Q2 to Q5 having internal choices.

3) Figure to right indicate full marks.

Q1) Multiple choice questions. **[20×½=10]**

a) In a linked list, insertion can be done as_____

   i) begining   ii) end

   iii) middle   iv) all

b) Generally collection of nodes is called as_____.

   i) Queue   ii) Graph

   iii) Linked list   iv) Stack

c) In a stack, if a user tries to insert an element in full stack, it is called_____.

   i) Overflow   ii) Underflow

   iii) Empty collection   iv) Garbage collection

d) Which method is used for retrieving the top element of the stack without deleting it

   i) POP()   ii) Dequeue()

   iii) Push()   iv) Peek()

e) Binary Tree is a special type of tree data structure in which every node can have a maximum_____children.

   i) 4   ii) 2

   iii) 1   iv) 0

f) Which of the following satisfies the property of the Red Black tree.

   i) A tree which is a Binary search tree but not strictly Balanced tree

   ii) A node must be either Red or Black in color and root node must be black

   iii) A tree with maximum three children

   iv) A tree which is binary search tree but not strictly balanced tree and A node must be either Red or Black in color and root node must be black

P.T.O.
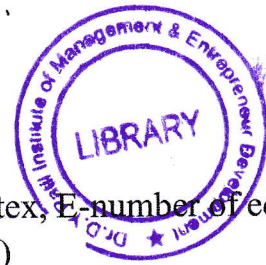
g) Time complexity of DFS is (V-number of vertex, E-number of edges).
i) O (V+E) ii) O (V)
iii) O (E) iv) None

h) For the adjocency matrix of a directed graph the row sum is_____degree and column sum is the _____degree.
i) in, out ii) out, in
iii) in, total iv) total, out

i) Heap can be used as_____.
i) Priority queue ii) Stack
iii) A decreasing order array iv) Normal array

j) What is the best case for linear search?
i) O(nlogn) ii) O(logn)
iii) O(n) iv) O(1)

k) In linear search with array, how many comparisons are needed in best case.
i) 0 ii) 1
iii) n iv) n/2

l) In what manner is a state space tree for a backtracking algorithm constructed?
i) Depth-first search ii) Breadth first search
iii) Twice around the tree iv) Hearest neighbour first

m) Back tracking algorithm is impemented by constructing a tree of choices called as
i) State space tree ii) State chart tree
iii) Node tree iv) Backtracking tree

n) What is the other name of dijkstra algorithm?
i) Single source shortest path
ii) Multiple source shortest path
iii) Multiple destination
iv) Single destination shortest path problem

o) The output of kruskal and prims algorithm is_____.
i) Maximum spanning tree ii) Spanning tree
iii) Minimum spanning tree iv) None

p) What is the worst case complexity of quicksort?
i) O(nlogn) ii) O(logn)
iii) O(n) iv) O(n²)

q) The optional data structure used to solve Tower of Hanoi is_____.
i) Tree ii) Heap
iii) Queue iv) Stack
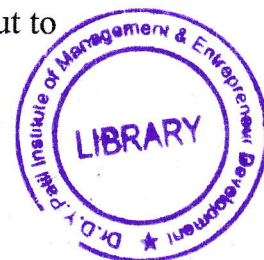
r) In dynamic programming the output to stage n become the input to
    i)   Stage n–1   ii)   Stage n it self
    iii)   Stage n+1   iv)   Stage n–2

s) We use dynamic programming approach when
    i)   We need on optimal solution
    ii)   The solution has optional sub structure
    iii)   The given problem can be reduced to 3 - SAT problem
    iv)   It's faster than Greedy

t) The relationship between stages of a dynamic programming problem is called_____
    i)   State   ii)   Random Variable
    iii)   Node   iv)   Transformation

Q2) a) Apply the algorithm to draw Binary search tree for the following data. 10, 08, 15, 12, 13, 07, 09, 17, 20, 18, 04, 05 **[5]**

b) Compare BFS and DFS. **[3]**

c) Explain Min Heap. **[2]**

OR

a) Apply DFS algorithm on the following graph and show the steps. **[3]**
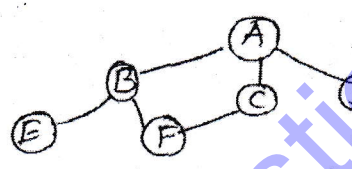
b) Construct Binary Tree for following data 10, 25, 2, 4, 7, 13, 11, 22 and determine inorder, postorder & preorder? **[5]**

c) Define Hash function 2 collision. **[2]**

Q3) a) Apply Rain Terrace algorithm to the following problem.
Input:- Height = [4, 2, 0, 3, 2, 5]. Draw the figure and find solution. **[4]**

b) Explain power set with example. **[3]**

c) Discuss use of priority queue. **[3]**

OR

a) What is Hamiltonian cycle? **[3]**

b) Find the Hamiltonian cycle from following graph. **[4]**
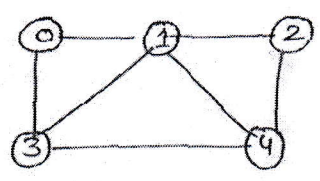
c) Write an algorithm to count number of nodes in singly linked list. **[3]**

Q4) a) What is Jump Game algorithm? **[4]**

b) Sort the following data using merge sort algorithm [38, 27, 43, 3, 9, 82, 10]. **[4]**

c) Explain need of circular queue. **[2]**

OR

a) Illustrate the stages, in finding the minimum cost spanning tree for given graph using Prim's algorithm. **[4]**
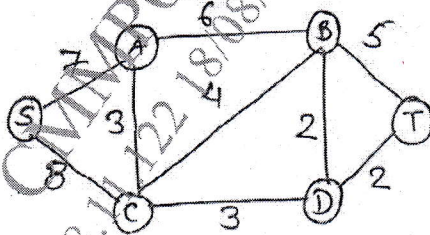
b) Explain Rules for Tower of Hanoi with an suitable example. **[4]**

c) What is the purpose of linked list? **[2]**

Q5) a) Consider the instance of 0/1 knapsack problem n = 3, m = 20, p = (25, 24, 15), w = (18, 15, 10) using dynamic programming. Determine the optimal profit and the solution vector. **[7]**

b) Write an algorithm to reverse the nodes of a linked list. **[3]**

OR

a) Find the longest common subsequence for following string using dynamic programming. **[7]**

X = {A, B, C, D, B, A, C, D, F}

Y = {C, B, A, F}

b) Write an algorithm delete element from linked list whose sum is equal to zero. **[3]**

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