VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

[Central Technological Institute, Maharashtra State]

Matunga, Mumbai-400 019

SEMESTER EXAMINATION	ESE 2013	DATE OF EXAM	24/5/2013
SEMESTER & PROGRAM	*S Y B Tech Computer Engg (Sem IV)*	TIME :	1·30 P·M
TIME ALLOWED	*3 HRS.*	MARKS	*100*
COURSE (CourseCode) :	*Data Structures and Algorithms (CO0208)*		

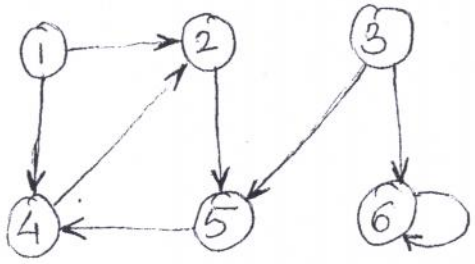
Instructions
1. **Q 1 is compulsory. Solve any four from remaining.**
2. Figures to the right indicate full marks.
3. Write algorithms stepwise, neat and clean. Avoid writing algorithm as descriptive sentences and paragraphs for clarity in steps.

Q 1	A	Is $2^{n+1} = O(2^n)$? Solve it step by step and show it.	04
	B	Give an adjacency-list representation for a complete binary tree on 7 vertices. Give an equivalent adjacency-matrix representation. Assume that vertices are numbered from 1 to 7 as in a binary heap.	04
	C	Convert given infix expression into prefix and postfix expression, show the steps ((A + B) * C - (D – E)) $ (F + G)	04
	D	Write recursive binary search algorithm and explain in brief.	04
	E	Define O-Notation and Ω-Notation with example	04
Q 2	A	What is stack? Write algorithm for operations on stack.	05
	B	Illustrate and explain (wherever necessary), the operation of Radix sort to sort following inputs: COW, DOG, SEA, RUG, ROW, MOB, BOX, TAB, BAR, EAR, TAR, DIG, BIG, TEA, NOW, FOX.	05
	C	Write and explain algorithm to implement stack operations using two queues. Find time complexity of every stack operation defined.	10
Q 3	A	Write algorithm to count number of nodes in the given single linked list. Explain your logic properly.	04
	B	Write algorithm to delete Nth last node (for eg 2nd last, 3rd last etc) of the single linked list. Explain your logic properly.	06
	C	Write algorithm to perform sorting in descending order using heap sort. Show sorting on following values: 25, 57, 48, 37, 12, 92, 86, 33	10
Q 4	A	Write and explain algorithm to delete smallest element from Binary search tree	05
	B	Write and explain algorithm to display in-order successor of every node in binary search tree	05
	C	Write and explain algorithm to create binary tree from given in-order and pre-order traversal. Dynamic memory allocation is expected. Input to this algorithm is two alphabetical strings representing in-order and pre-order respectively.	10

Note: steps should not be written in descriptive sentences or paragraphs.

Q 5 A When an adjacency-matrix representation is used, most graph algorithms require time $\Omega(V^2)$, but there are some exceptions. Show that determining whether a directed graph G contains a universal sink (it is a vertex with in-degree |V| - 1 and out-degree 0) can be determined in time O(V), given an adjacency matrix for G. Write algorithm to achieve same. Show calculations for time complexity O(V). Explain this with example. 10

B Explain BFS algorithm on graph with calculating Distance and predecessor of vertices. Show the d and π values that result from running breadth-first search on the directed graph shown below using vertex 3 as the source. 10



Q 6 A What are steps for dynamic programming? Explain solution step by step to find Longest common subsequence using dynamic programming. 10

B Explain quick sort with example. 10