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RV COLLEGE OF ENGINEERING®

Autonomous Institution affiliated to VTU

V Semester B. E. Examinations Jab/Feb-21

Computer Science and Engineering

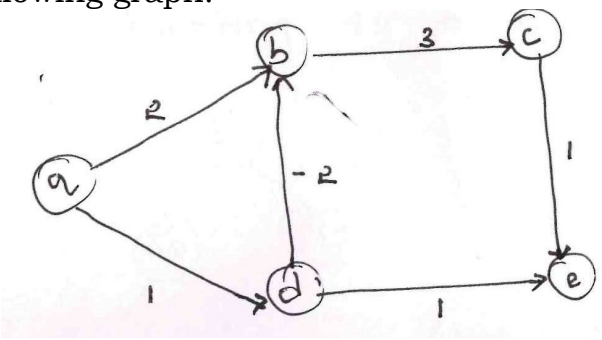
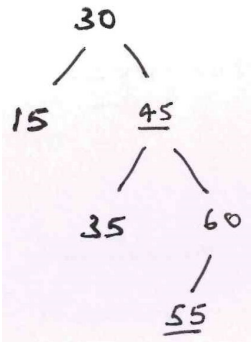
ADVANCED ALGORITHMS (ELECTIVE)

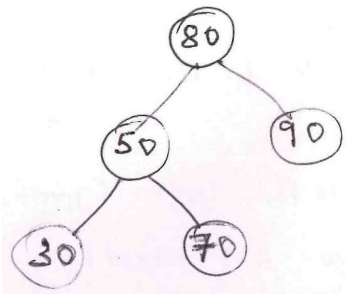
Time: 03 Hours ***Maximum Marks: 100***

Instructions to candidates:

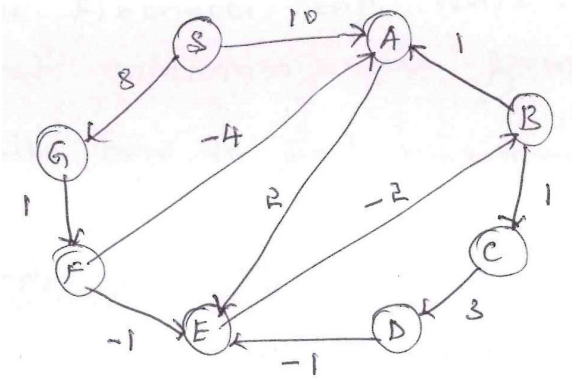
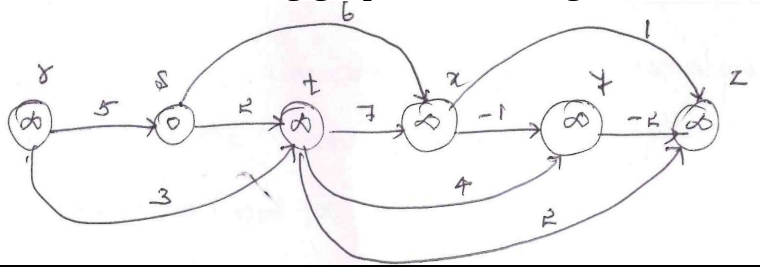
1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6

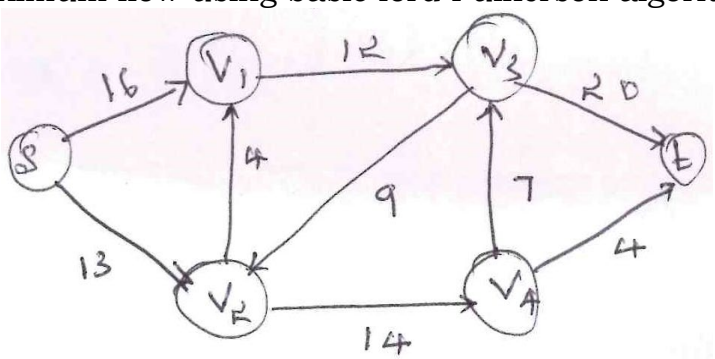
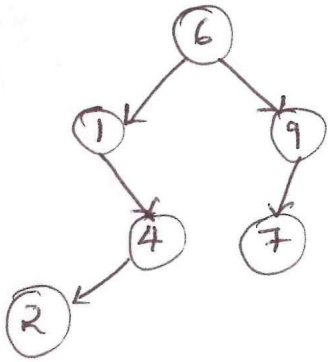
PART-A

1	1.1	Compute $\sum_{1 \le k \le n} O(n)$.	02
	1.2	Solve the following recurrence relation $T(n) = 3T(n/2) + n^2$.	02
	1.3	State the basic principle of Rabin Karp algorithm.	01
	1.4	What is the number of edges present in a complete graph having n vertices?	01
	1.5	Bellmann ford algorithm provides solution for _____ problems.	01
	1.6	Find the GCD of 244 and 117 using Euclid's method.	02
	1.7	What is the special property of red-black trees and what root should always be?	02
	1.8	Consider the following graph:  Find the minimum cost to travel from node A to node C.	02
	1.9	Show the result of inserting 50 into the Red-Black tree depicted below:  	02
	1.10	What are splay trees?	01

	1.11	What is the time complexity of Johnson's algorithm?	01
	1.12	What is the worst-case running time of Rabin-Karp algorithm?	01
	1.13	Obtain a splay tree for following tree, after inserting 40 to it. 	02

PART-B

2	a	What are asymptotic notations? Explain them.	06
	b	Solve the following recurrence using master's theorem. Also state which case is applicable? $T(n) = 4T(n/2) + n^2$.	05
	c	Solve the following recurrence relation using recursion tree method. $T(n) = 4T(n/2) + n$.	05
3	a	Write the Naïve string matching algorithm. Show the operation of the same, for the pattern $p = 0001$ in the test. $T = 0\,0\,0\,0\,1\,0\,0\,0\,1\,0\,1\,0\,0\,0\,1$	08
	b	Construct the string matching automation for the pattern $p = aabab$ and illustrate its operation on the text string. $T = a\,a\,a\,b\,a\,b\,a\,a\,b\,a\,a\,b\,a\,b\,a\,a\,b$	08
		OR	
4	a	Demonstrate with an algorithm, the working procedure Bellman-Ford algorithm for solving single source shortest path problem for the graph shown below. 	08
	b	Write an algorithm for single-source shortest path in BAG. Also apply the algorithm for the following graph and taking source vertex as 's'. 	08

5	a	Find the maximum flow using basic ford Fulkerson algorithm.  	08
	b	Explain the properties of red-black tree. Construct a red-black tree by inserting following sequence of number: 8, 18, 5, 15, 17, 25, 40 & 80.	08
		OR	
6	a	Define Fibonacci heap. Write an algorithm to extract minimum node from the Fibonacci heap.	05
	b	Describe how to find maximum bipartite matching for a given graph, considering suitable example.	05
	c	Perform the splay delete operation on the given tree shown in figure below to node x.  	06
7	a	Write modular-linear-equation-solver algorithm and using the same, solve the following $14 \times \equiv 30(mod\ 100)$.	08
	b	Apply the Chinese remainder theorem, to the following equations: i) $a \equiv 2(mod\ 5)$ ii) $a \equiv 3(mod\ 13)$	08
8	a	Investigate the two trays of representing polynomials.	05
	b	Characterize the efficient implementation of iterative FFT.	05
	c	Characterize the pseudocode for Artificial Bee Colony (ABC) algorithm.	06