June-2022 PG Examinations

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18MCE12

RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU, Belagavi)

I Semester Master of Technology (Computer Science and Engineering)

ADVANCES IN ALGORITHMS AND APPLICATIONS

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

Instructions to candidates:

1. Each unit consists of two questions of 20 marks each.
2. Answer FIVE full questions selecting one from each unit.

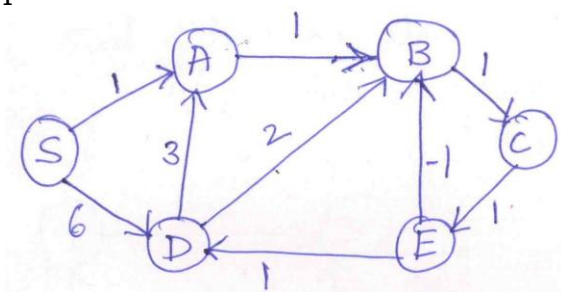
UNIT-1

1	a	Define asymptomatic notations O, θ, Ω, o, w with neat diagram.	08
	b	Show that the solution of $T(n) = T([n/2]) + 1$ is $O(lgn)$.	06
	c	Write algorithm for counting sort and sort $A = \{6, 0, 2, 0, 1, 3, 4, 6, 1, 3, 2\}$.	06
		OR	
2	a	Draw the recursion tree for $T(n) = 4T([n/2]) + cn$ where c is a constant, and provide a tight asymptomatic bound on its solution. Verify your bound by substitution method.	08
	b	Perform radix sort on $\{329, 457, 657, 839, 436, 720, 355\}$.	06
	c	Write algorithm for Bucket sort and sort the following elements $\{0.79, 0.13, 0.16, 0.64, 0.39, 0.20, 0.89, 0.53, 0.71, 0.42\}$.	06

UNIT-2

3	a	Mention the steps to optimally parenthesize a matrix chain. Explain the steps with an example. Find optimal paranthesization of a matrix-chain product whose sequence of dimensions is $\{5, 10, 3, 12, 5, 50, 6\}$.	10
	b	Explain amortized analysis of stack operations for aggregate, accounting and potential methods.	10
		OR	
4	a	Write algorithm for longest common subsequence and determine LCS of $\{1, 0, 0, 1, 0, 1, 0, 1\}$ and $\{0, 1, 0, 1, 1, 0, 1, 1, 0\}$.	08
	b	List the steps involved in design of greedy algorithms.	04
	c	Explain potential method of incrementing a binary counter in detail.	08

UNIT-3

5	a	Apply Bellmanford on a given graph in Fig. 5.a with source vertex S with all the iterations. What is the complexity of algorithm? Illustrate the algorithm steps.  Fig. 5.a	10

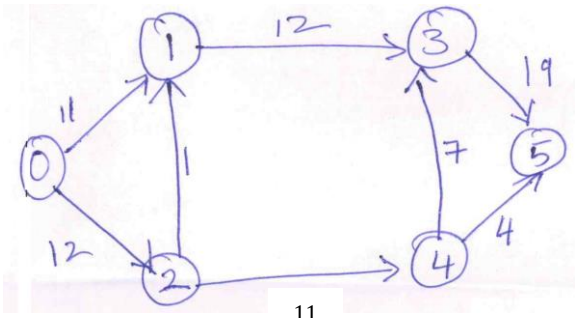
	b	Six reporters Asif (A), Becky (B), Chris (C), David (D), Emma (E), and Fred (F) are to be assigned to six news stories Business: (1), Crime (2), Finance (3), Foreign (4), Local (5), and Sport (6). The table shows possible allocations of reporters to news stories.	

	1	2	3	4	5	6
A					✓	
B	✓					
C	✓	✓		✓		
D					✓	
E			✓		✓	✓
F				✓		

i) Show these allocation on a bipartite graph.
ii) Use appropriate algorithm to find a maximal matching. 10

OR

6	a	Explain Johnson Algorithm and mention importance of Dijkstra algorithm in Johnson Algorithm.	10
	b	Write Ford Fulkerson algorithm and find max flow for the below graph in Fig. 6.b.	



11

Fig. 6.b 10

UNIT-4

7	a	Write an algorithm for insert in Fibonacci heap. What is the value of potential function ∅ for the following heap in Fig. 7.a? Marked nodes are shown in bold.	

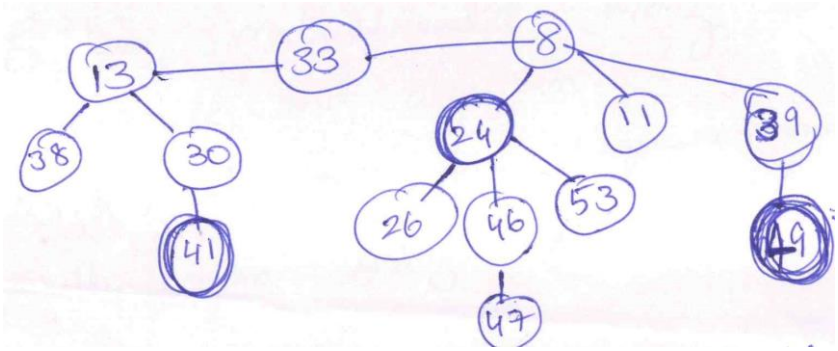


Fig. 7.a 10

	b	Draw finite automata table and figure for the pattern $ACACAGA$. Illustrate the algorithm.	10

OR

8	a	Illustrate implementation of append and union on linked list representation of disjoint sets.	06
	b	Working modulo $q = 11$, explain Rabin-Karp algorithm for string matching of the pattern 14159 in the text $T = 3141592$. Give the pseudo code of the alg.	10
	c	Draw prefix table for KMP for pattern "$ACAAAAB$".	04

UNIT-5

9	a	Explain multithreaded merge sort with an example and algorithm.	10
	b	Write an algorithm for P square matrix multiplication using recursion.	10
		OR	
10	a	Explain Strassen's multithreading method with example.	10
	b	Explain the terms, spawn, sync and parallel with example.	10