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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU)

IV Semester B. E. Grade Improvement Examinations Nov-2020

Common to CS / IS

DESIGN AND ANALYSIS OF ALGORITHMS

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

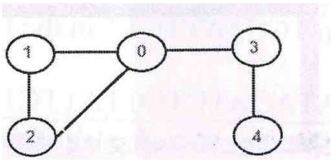
Instructions to candidates:

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

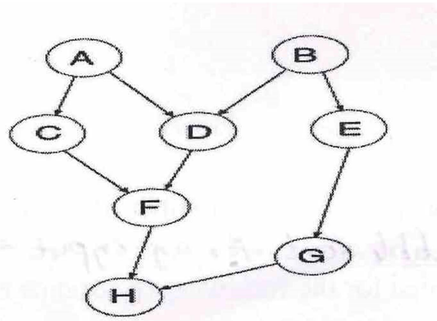
1	1.1	The operation of the algorithm that contributes the most to the running time is known as ________.	01

	1.2	What is the time complexity of the following code looping statement: (c is a constant):
		$int\ i = 1;$
		do
		{
		$i = i * c;$
		}
		$while(i <= n);$
			02

	1.3	Write the generalized form for the maximum number of key comparisions done in bubble sort for an input size of n.	01
	1.4	Mention why Master Theorem can't be applied for the following recurrence relation: $T(n) = 2^n T(n/2) + n^n$.	01
	1.5	Give an example for in-place algorithm.	01
	1.6	The edge which from a vertices to their descendants in the tree other than their children is known ________.	01
	1.7	Breadth-first search method of graph traversal cannot be used to determine ________.	01
	1.8	Mention the three ways the algorithm/problem can be transformed in transform and conquer.	01
	1.9	Count the number of paths of size 2 that exists in the graph given below:  	02
	1.10	Construct the good suffix table for the substring $bcbcbc$.	02
	1.11	The Floyd-warshall all pairs shortest path algorithm computes the shortest paths between each pair of nodes in ________ time complexity.	01
	1.12	Mention any two real time application of Huffman coding.	01

1.13	Problems that can be solved in polynomial time are called as _________.	01
1.14	What is promising and non-promising nodes?	02
1.15	Which of the following problems has highest run-time complexity: i) Tower of Hanoi ii) Fibonacci Series iii) Prime number series	01
1.16	_________ and _________ are main measures for the efficiency of an algorithm.	01

PART B

2	a	Outline the general frame work for analyzing the efficiency of the algorithms with an example.	06
	b	With an example explain asymptotic notations. Mention the basic efficiency classes with example for any two efficiency classes.	06
	c	Write an algorithm for selection sort and find its efficiency class.	04
3	a	Sort the list E, X, A, M, P, L, E in alphabetical order using Quick Sort	06
	b	Write the algorithm for merging and sorting. Write the recurrence relation and mention the time complexity of merge sort.	06
	c	Analyze the time complexity of multiplication of large integers using divide and conquer.	04
		OR	
4	a	Differentiate between DFS and BFS and mention its real time application.	05
	b	Apply the source removal an DFS based algorithm (Assume 'A' as source node) to solve the topological sorting problem for the following digraph : (Steps to be shown)  	06
	c	Generate all permutations of {1,2,3,4} by the Johnson-Trotter algorithm.	05
5	a	Construct $2-3$ for the following elements : 7,6,3,2,1,10,11,34,25	06
	b	Apply Horspool's algorithm to locate the pattern $TCCTATTCTT$ in the following DNA sequence: $TTATAGATCTCGTATTCTTTTATAGATCTCCTATTCTT$	06
	c	Write the naïve string matching algorithm.	04
		OR	

6 a Construct the heap using bottom up method and perform heap sort for the following elements: 1,2,3,4,5,6,7,8,9,10 (sort in ascending order) 06

b Apply Boyer Moore algorithm to locate the pattern $TCCTATTCTT$ in the following DNA sequence:

$$TTATAGATCTCGTATTCTTTTATAGATCTCCTATTCTT$$

06

c Analyze the time complexity of computing mode using input enhancement with an algorithm. 04

7 a Construct a Huffman code for the following data:

$Symbol$	A	B	C	D	$-$
$Frequency$	0.4	0.1	0.2	0.15	0.15

Decode 1010011010100 05

b Apply the bottom-up dynamic programming algorithm to the following instance of the knapsack problem:

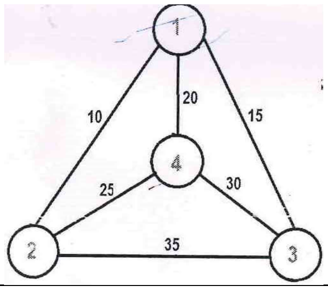
$item$	$Weight$	$Value$
1	3	\$25
2	2	\$20
3	1	\$15
4	4	\$40
5	5	\$50

Capacity $W = 6$ 07

c Write an algorithm to find the minimum spanning tree using Prim's algorithm. 04

8 a Apply backtracking to the problem of finding n-Queens for $n = 5$ (2 solutions and 2 no solution). How many solutions are there for $n = 4$. 08

b Apply the branch and bound algorithm to solve the travelling salesman problem for the following graph:



08