

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
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College of Engineering & Technology, Amravati
Course: Information Technology
BE Four year Semester (Information technology) Summer 2020 Exam
Subject: 5FEKS05 Data structures and Algorithms
Assignment for ONLY BACKLOG STUDENTS

Instructions

- 1) Solve ANY TWO Questions**
- 2) Each Question Carries 10 marks**

Q1) Solve the following

- 1) Consider pattern $P = aaabb$. Construct the table and the corresponding labeled directed graph used in the "fast" pattern matching algorithm. [2M]
- 2) Consider the following multidimensional array: $X(-5:5, 3:33)$ $Y(3:10, 1:15, 10:20)$
 - i) Find the length of each dimension and the number of elements in X and Y
 - ii) Suppose $Base(Y) = 400$ and there are 4 words per memory location. find the effective indices E_1, E_2, E_3 and the address of $Y(5, 10, 15)$ by Row-major order and column major order. [2M]
- 3) Define Doubly Linked list [2M]
- 4) Consider the following stack, where STACK is allocated $N=4$ memory cells :
STACK : AAA, BBB, ____, ____
Describe the stack as the following operations take place :
 - i) POP (STACK, ITEM)
 - ii) POP (STACK, ITEM)
 - iii) PUSH (STACK, EEE)
 - iv) POP (STACK, ITEM) [2M]
- 5) Define Full Binary tree with example [1M]
- 6) Apply Insertion sort to the following numbers
33,55,11,22,77,88,99,44,66 [1M]

QII) Solve the following

- 1) Consider a text string $T=(abc)^5$. Determine the number of comparisons required to find the index I of the following pattern strings in the text T
i) $P=cde$ ii) $p=cab$ [2M]
- 2) What is Pointer array? What is Need of pointer array? Explain with example. [2M]
- 3) Discuss the advantages, if any, of two-way list over a one-way list for each of the following operations :
i) Traversing the list to process each node
ii) deleting a node whose location LOC is given
iii) Searching an unsorted list for a given element ITEM.
iv) Searching a sorted list for a given element ITEM. [2M]
- 4) Consider the following stack, where STACK is allocated $N=4$ memory cells :
STACK : AAA, BBB, ____, ____
Describe the stack as the following operations take place :
i) PUSH (STACK, GGG)
ii) PUSH (STACK, HHH) [2M]
- 5) Explain WARSHALL'S Algorithm [1M]
- 6) Apply Merge Sort to the following numbers
22,33,56,77,11,24,68,34,91,12 [1M]

Q III) Solve the following

- 1) Consider a text string $T=(abcde)^5$. Determine the number of comparisons required to find the index I of the following pattern strings in the text T
i) $P=abcde$ ii) $p=cde$ iii) $P=eabcd$ iv) $P=ijkf$ [2M]
- 2) Prove the identity $1+2+3+\dots+n=n(n+1)/2$ [2M]
- 4) Let J and K be in integers and suppose Q(J, K) is recursively defined by
$$Q(J, K) = 5 \quad \text{if } J < K$$
$$= Q(J-K, K+2) + J \quad \text{if } J \geq K$$

Find $Q(2, 7)$ $Q(5, 3)$ [2M]
- 5) Define Stack and Queue [1M]
- 6) Explain Inorder, Preorder and Post order [1M]
- 7) Apply Selection sort to the following numbers
45,23,56,78,11,33,59 [2M]

QIV) Solve the following

1) Let S and T be a character array variable such that

S= "WE THE PEOPLE" and T="OF THE UNITED STATES" Find

- I. Length of T and length of S
- II. INDEX (S, 'E')
- III. INDEX(T, 'THEN')
- IV. SUBSTRING(S,4,10)||'ARE'||SUBSTRING (T,8,6) [2M]

2) Using the Bubble sort algorithm, Find the number C of comparisons and the number D of interchanges which alphabetized the letters PEOPLE. [2M]

3) Write an algorithm to insert ITEM after a given node. [2M]

4) Consider the following arithmetic infix expression Q :

Q: $A+(B*C - (D / E \uparrow F) * G) * H$

Use algorithm to transform Q into its equivalent postfix expression p. [2M]

5) Define Binary tree and Strictly Binary tree [1M]

6) Define Graph and Degree of Graph [1M]