Graphic Era
HILL UNIVERSITY
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University under section 2(f) of UGC Act, 1956

Mid Term (Odd) Semester Examination October 2024

Roll no.....

Name of the Course and semester: MCA 3rd Semester
Name of the Paper: Design and Analysis of Algorithms
Paper Code: TMC-301
Time: 1.5 hour

Maximum Marks: 50

Note:

(i) Answer all the questions by choosing any one of the sub questions
(ii) Each question carries 10 marks.
(iii) Please specify COs against each question.

Q1. (10 Marks)

a. Explain the various criteria used for analyzing algorithms. List the properties of various asymptotic notations. (CO1)

OR

b. Explain Merge sort algorithm and sort the following sequence {23, 11, 5, 15, 68,31, 4, 17} using merge sort. (CO2)

Q2. (10 Marks)

a. What are recurrence relations? Solve the following recurrence relation using substitution method:
(i) $T(n) = T(n-1) + \log_2 n$; if $n>1$ and $T(n)=1$; if $n=1$
(ii) $T(n) = T(n-1) * n$; if $n>1$ and $T(n)=1$; if $n=1$ (CO1)

OR

b. What are the major differences between Merge sort and Quick sort? Write an algorithm for Randomized Quick sort & analyze its complexity. (CO2)

Q3. (10 Marks)

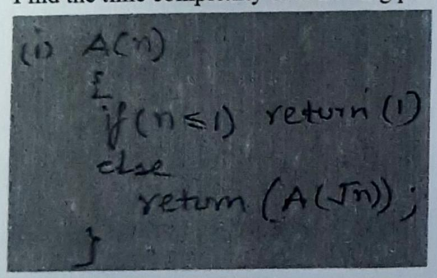
a. Solve the following recurrence relation.
(i) $T(n) = 3T(n/2) + n^2$
(ii) $T(n) = 4T(n/2) + n^2$ (CO1)

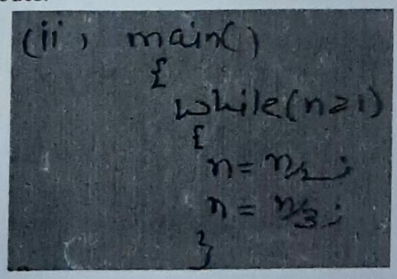
OR

b. Differentiate between Linear search and Binary search. Write the pseudocode for recursive binary search assuming that the given array elements are arranged in decreasing order. Also discuss the time complexity of Binary search. (CO2)

Q4. (10 Marks)

a. Find the time complexity of following pseudocodes: (CO1)





OR

b. What is stable sorting algorithm? Which of the sorting algorithms we have seen are stable and which are unstable? Give name with explanation. (CO2)

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Q5. (10 Marks)

a. Solve the given recurrence relation using recursion tree method: $T(n) = T(2n/5) + T(3n/5) + n$ (CO1)

OR

b. Write the pseudocode for Quicksort algorithm and analyze it to find its time complexity in worst case and average case. Apply Quicksort to sort the given array {36, 2, 9, 20, 15, 1, 8}. (CO2)