0077-BSCS-20
WASEEM AKRAM
BAJWA

Roll No.

COMPULSORY OBJECTIVE QUESTION

EXAMINATION: SUMMER 2017 **SUBJECT: Design & Analysis of Algorithms** **COURSE CODE: CS-3118**

TIME ALLOWED: 25 Minutes **MAX MARKS: 12**

Multiple Choices: Select the best option. **12*1 = 12**

1. What is the running time to retrieve an element from an array of size n?
   a. O(n – 1) b. O(n) c. O(n/2) d. O(1)
2. The time complexity of binary search is:
   a. O(1) b. O(log n) c. O(n) d. O(n log n)
3. How many passes are required to sort a file of size n by bubble sort methods?
   a. n^2 b. n c. n – 1 d. quick sort
4. Which one is in-place and stable sort:
   a. Heap sort b. Quick sort c. Merge sort d. All of these

5. The time complexity of the following function is (assuming n > 0)

```
int recursive (int n)
{
        if (n ==1) return 1;
        else
        return recursive (n -1)+ recursive (n -1);

}
```

Actual is 2^n but closest is b

   a. O(n) b. $O(n^2)$ c. $O(n \log_2 n)$ d. $O(n^3)$

6. The time factor when determining the efficiency of algorithm is measured by:
   a. Counting microseconds b. Counting the number of key operations
   c. Counting the number of statements d. Counting the kilobytes of algorithm
7. What is the max. number of comparisons that can take place when a bubble sort is implemented? Assume there are n elements in the array?
   a. [1/2][n – 1] b. [1/2]n[n – 1] c. [1/4]n[n – 1] d. None of these
8. ---------- solves the problem of finding the shortest path from a point in a graph to a destination.
   a. Kruskal's algorithm b. Prim's algorithm
   c. Dijkstra algorithm d. Bellman ford algorithm
9. The time complexity of heap sort in worst case is:
   a. $O(n^2)$ b. O(log n) c. O(n) d. O(n log n)

10. The divide and conquer strategy is used for problems such as sorting to reduce the complexity from
    a. $O(n^2)$ b. O(log n) c. O(n) d. O(n log n)
11. BFS and DFS follows ---------- and ---------- respectively.
    a. LIFO and FILO b. Push-pop and Queue-dequeue c. FIFO and LIFO d. None of these
12. A pivot element to partition unsorted list is used in:
    a. Merge sort b. Quick sort c. Insertion sort d. Selection sort

SUBJECTIVE QUESTION

EXAMINATION: SUMMER 2017 SUBJECT: Design & Analysis of Algorithms COURSE CODE: CS-3118

TIME ALLOWED: 155 Minutes MAX MARKS: 48

Note: Attempt any FOUR questions, each question carry equal marks.

Marks

Q. No. 2 (a) Discuss NP Complete problem (6)

(b) Solve the following Recurrence using Substitution Method (6)

$$T(n) = \begin{cases} 2T(n-1)+1 & , \quad n > 1 \\ 1 & , \quad n = 1 \end{cases}$$

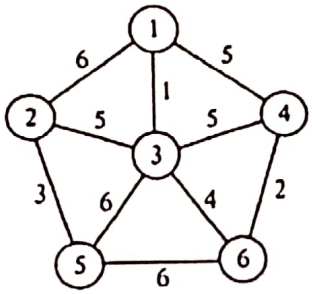
Q. No. 3 (a) Determine the running time of MERGESORT for

1. Sorted input
2. Reverse order input
3. Random order input

(7)

(b). Write the pseudo for Binary Search then compute its worst-case complexity. (5)

Q No. 4 (a) Find the minimum spanning tree of the following graph (5)



(b) Write the four properties of RB-Tree (4)

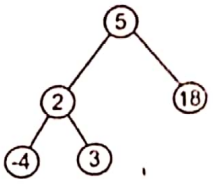
(c) What is dynamic programming algorithm (3)

Q No. 5 (a) Use the definition of BIG-Oh to prove that (4)

0.01 n log(n) – 2000n + 6 is O(n log n).

(b) Define and explain θ notation. (5)

(c) Give Array representation of the binary tree given below: (3)



Q No. 6 (a) Explain the Prim's algorithm for finding minimum spanning tree (6)

(b) Write an algorithm for Quick Sort. Explain with example and show the analysis for the algorithm. (6)

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OBJECTIVE QUESTION PAPER

EXAMINATION: FINAL 2015 **SEMESTER V** **COURSE CODE:** CS-3108

SUBJECT: BSCS **TITLE:** Design and Analysis of Algorithms

TIME ALLOWED: 25 MINUTES **MAX MARKS:** 14

Q # 01:	**Encircle the correct answer.** NOTE: Erasing/Cutting and over writing shall bear "NO MARKS".	Marks
1	**Which among the following is the best when the list is already sorted** (a) Insertion sort (b). Merge sort (c). Selection sort (c). None of the above	1
2	**The time complexity of the normal quick sort, randomized quick sort algorithms in the worst case is _____** (a) $O(n^2)$, $O(n \log n)$ (b) $O(n^2)$, $O(n^2)$ (c) $O(n \log n)$, $O(n^2)$ (d) $O(n \log n)$, $O(n \log n)$	1
3	**The running time of quick sort depends heavily on the selection of** (a) No of Inputs (b) Arrangements of elements in an array (c) Size of elements (d) Pivot	1
4	**The _____notation provides an asymptotic upper bound.** (a) Θ (b) O (c) o (d) Ω	1
5	**The Sorting method which is used for external sort is _____** (a) Bubble sort (b) Quick sort (c) Merge sort (d) Radix sort	1
6	**_____ is one of the simplest algorithms for searching a graph.** (a) Breadth-first search (b) Linear (c) Binary (d) None of these	1
7	**What is the best-case time for merge sort to sort an array of n elements?** (a) O(n)	1

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	(b) O(nlogn) (c) O(logn) (d) $O(n^2)$	
8	**Which of the following case does not exist in complexity theory** (a) Best case (b) Worse case (c) Average case (d) Null case	1
9	**Graph is represented by _____** (a) G = (V,N) (b) G = (V,E) (c) G = (R,N) (d) G = (V,R)	1
10	**Hashing can provide excellent worst-case performance when the set of keys is _____:** (a) Dynamic (b) Static (c) ascending order (d) None of these	1
11	**One of the important properties of red black tree is that If a node is _____, then both its children are _____.** (a) Red, Red (b) Black, Black (c) Black, Red (d) Red, black	1
12	**The running time of heapify is given by** (a) T(n)=T(n/2)+n (b) T(n)=T(n)+1 (c) T(n) =T(2n/3)+ Omega(1) (d) . None of the above	1
13	**The complexity of the average case of an algorithm is _____** (a) Much more complicated to analyze than that of worst case (b) Much more simpler to analyze than that of worst case (c) Sometimes more complicated and some other times simpler than that of worst case (d) None of above	1
14	**Which of the following is true *** (a) Merge sort takes T(n)=2T(n/2)+O(n) (b) b.Merge sort takes T(n)=3T(n/2)+O(n) (c) c.Quick sort takes O(n^2) time in its average case (d) d. None of the above	1

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SUBJECTIVE QUESTION PAPER

EXAMINATION: FINAL 2015 **SEMESTER:** V **COURSE CODE:** CS-3108

SUBJECT: BSCS **TITLE:** Design and Analysis of Algorithms

TIME ALLOWED: 155 MINUTES **MAX MARKS:** 56

NOTE: Attempt any FOUR Questions from the following. All questions carry equal marks

Q No's	Questions	Marks
Q # 02	a) Explain briefly big oh Notation, Omega Notation and Theta Notations, give Examples. b) Solve the following recurrence using master method: $T(n) = 2T(n/2) + \sqrt{n}$ c) List the properties of a binary tree.	7 + 4 + 3
Q # 03	A- Write pseudo code, either iterative or recursive for binary search. Argue that the worst-case running time of binary search is lgn. b) Show that there are at most $\lceil n/2^{h+1} \rceil$ nodes of height h in any n-element heap. c) Illustrate the operation of Build-Max-Heap on the array A {5, 13, 2, 25, 7, 17, 20, 8, 4}.	4 + 6 + 4
Q # 04	a) Use a recursion tree to determine a good asymptotic upper bound on the recurrence $T(n) = 3T(n/4) + cn^2$. b) Suppose that we were to rewrite the for loop header in line 10 of the COUNTING SORT as **for j=1 to A.length** Show that the algorithm still works properly. Is the modified algorithm stable? c) Observe that the while loop of lines 5–7 of the INSERTION-SORT procedure in uses a linear search to scan (backward) through the sorted sub array A [1….j-1]. Can we use a binary search instead to improve the overall worst-case running time of insertion sort to, nlgn?	6 + 4 + 4
Q # 05	a) When and how dynamic programming approach is applicable? b) What are priority queues and their basic operations? What type of applications would require priority queues operations? c) Give the Bubble sort algorithm and analyze efficiency?	5 + 4 + 5
Q # 06	a) Illustrate the operation of counting sort on the following array: A=<6,0,2,0,1,3,4,6,1,3,2> b) Define B-trees Basic operations on B-trees.? c) Solve the following recurrence using substitution method: $T(n) = 2T(\sqrt{n}) + \lg n$	5 + 5 + 4

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Course Title:	Design & Analysis of Algorithms	Objective Type		Maximum Marks:	12
Course Code:	CS-3108	Semester:	5th	Time Allowed:	20 mins

Q.1: Choose suitable Answers for the following: **(12)**

1. The complexity of the average case of an algorithm is:

(A) Much more complicated to analyze than that of worst case

(B) Much more simpler to analyze than of worst case

(C) Sometimes more complicated and some other times simpler than that of worst case

(D) None of these

2. Time complexity of binary search tree is

(A) O(1) (B) O(log n) (C) O(n) (D) $O(n^2)$

3. If algorithm A has running time $7n^2+2n+3$ and algorithm B has running time $2n^2 - 14$, then

(A) A is asymptotically greater (B) B is asymptotically greater

(C) Both have same asymptotic time complexity (D) None of these

4. Which of the following sorting procedure is slowest

(A) Quick sort (B) Heap sort (C) Bubble sort (D) Shell sort

5. Consider the following algorithm:

```
Factorial (n) { If (n=1)
return 1
Else
Return (n*Factorial(n-1)) }
```

Recurrence for this algorithm is:

(A) T(n)=T(n−1)+1 (B) T(n)=T(n(n−1))+1

(C) T(n)= nT(n−1)+1 (D) T(n)=T(n−1)+n

6. Which of the following does not exist in complexity theory

(A) Best case (B) Worst case (C) Average case (D) Null case

7. Finding the location of the element with a given value is:

(A) Search (B) Traversal (C) Both of these (D) None of these

8. In quick sort the number of partitions into which the file of size **n** is divided by a selected record is

(A) n (B) n-1 (C) 2 (D) n/2

9. There are four algorithms A1, A2, A3, A4 to solve the given problem with the order log(n), nlog(n), log(log(n)), n/log(n), Which is the best algorithm.

(A) A1 (B) A2 (C) A3 (D) A4

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Name: ---------- Roll #: ---------- Section: ----

10. The way a card game player arranges his card as he picks them one by one can be compared to
(A) Quick sort (B) Merge sort (C) Insertion sort (D) Bubble sort

11. What is the type of algorithm used in 8 Queens problem
(A) Back tracking (B) Dynamic (C) Branch and bound (D) Greedy

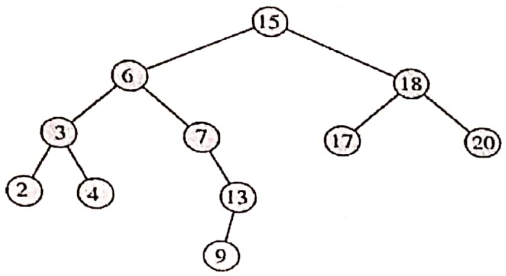
12. The correctness and appropriateness of _____ can be checked very easily
(A) Heuristics solutions (B) Random solutions (C) Algorithmic solutions (D) None of these

Name: ---------- Roll #: ---------- Section: ----------

Course Title:	Design & Analysis of Algorithms	Subjective Type		Maximum Marks:	48
Course Code:	CS-3108	Semester:	5th	Time Allowed:	2 hrs

Note: Solve any 4 questions.

Q.2: (i) Traverse the tree using In-Order, Pre-Order and Post-Order traversal techniques:



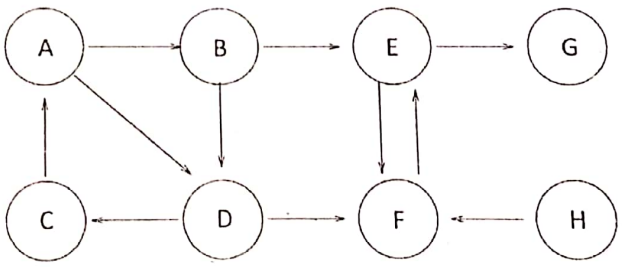
(ii) Define Min-Heap and Max-Heap with the help of examples.

Q.3: (i) Write *Quick-Sort* algorithm with partition and also calculate ***Best-case and Worst-case*** comple of *Quick-Sort* algorithm.

(ii) Define the following

(A) Feasible solution and optimal solution
(B) Dynamic programming and greedy approach

Q.4: (i) Find the minimum spanning tree of the following graph:



(ii) What are Red-Black trees and B-trees? What is the best use case for each of them?

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Q.5: (i) What are the key advantages of insertion, quick, merge and heap sort? Which one is best sorting algorithm. (6)

(ii) If $T(n) = \frac{1}{2}n^2 - 3n = \theta(n^2)$, then find n_0, c_1, *and* c_2. Also, formally define basic asymptotic notations. (6)

Q.6: (i) Solve the recurrences by using Master's method. (6)

a) $T(n) = 3T(n/2) + n \lg n$

b) $T(n) = 4T(n/2) - \sqrt{n}$

(ii) Solve the recurrence by using Recursion tree method: $T(n) = 3T(n/4) + cn^2$ (3)

(iii) Solve the recurrence by using Iterative method: $T(n) = 4T(n/2) + n$ (3)

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