Code: AC64/AT64/ AC115/AT115
Subject: DESIGN & ANALYSIS OF ALGORITHMS

AMIETE – CS/IT (Current & New Scheme)

Time: 3 Hours | **Deember - 2017** | **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 **Choose the correct or the best alternative in the following:** **(2×10)**

a. Find out the result of the postfix expression
   3 2 3 ^ + 3 2 1 + * -
   (A) 2   **(B)** 3
   (C) 4   **(D)** 5

b. The solution for recurrence relation $c_n = n + c_{[n/2]}$ is _____ when 'n' is a power of 2 with $n = 2^k$ and $c_1 = 0$
   (A) 2n-1   **(B)** n-1
   (C) 2n-2   **(D)** 2n-3

c. The worst case occur in linear search algorithm when _____.
   (A) item is somewhere in the middle of the array
   (B) item is not in the array at all
   (C) item is the first element in the array
   (D) item is the last element in the array or item is not there at all

d. The complexity of bubble sort algorithm is _____.
   (A) O(n)   **(B)** O(logn)
   (C) $O(n^2)$ **(D)** O(n logn)

e. Which of the following sorting algorithm is of divide and conquer type?
   (A) Bubble sort   **(B)** Insertion sort
   (C) Merge sort   **(D)** Selection sort

f. Two main measures for the efficiency of an algorithm are
   (A) processor and memory   **(B)** complexity and capacity
   (C) time and space complexity   **(D)** data and space

g. The time complexity of quick sort in average case is _____.
   (A) O(n)   (B) O(logn)
   (C) O(n2)   (D) O(n logn)

h. The worst case time complexity of the nondeterministic dynamic knapsack
   algorithm is
   (A) O(n log n)   (B) O(log n)
   (C) $O(n^2)$ (D) O(n)

i. The Knapsack problem where the objective function is to minimize the profit is
   (A) Greedy   (B) Dynamic 0 / 1
   (C) Back tracking   (D) Branch & Bound 0/1

j. What is the type of the algorithm used in solving the 8 Queens problem?
   (A) Greedy   (B) Dynamic
   (C) Branch and Bound   (D) Backtracking.

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. Define ADT and write short notes on fundamental data structures.   **(10)**

  b. Show the stack after each operation of the following sequence that starts with the
      empty stack:
      push(a), push(b), pop, push(c), push(d), pop   **(6)**

Q.3 a. Solve the recurrence relation
         M(n) = M(n − 1) + 1 + M(n − 1) for n > 1.   **(8)**

  b. Discuss the major asymptotic notations   **(8)**

Q.4 a. Give the algorithm for selection sort. Using selection sort, sort the following
      numbers   **(8)**
       89 45 68 90 29 34 17

  b. Write notes on Brute-Force String Matching   **(8)**

Q.5 a. Discuss Exhaustive search with travelling salesman problem.   **(8)**

 b. With an example, explain Depth First Search   **(8)**

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Q.6 a. Give the algorithm for evaluating right-left binary exponentiation and left-right binary exponentiation **(8)**

b. Using Heap sort, sort the following

     2   9   7   6   5   8 **(8)**

Q.7 a. With an example explain the knapsack problem. **(8)**

b. Define the transitive closure of a digraph. Compute the transitive closure for the following digraph using warshall's algorithm. **(8)**
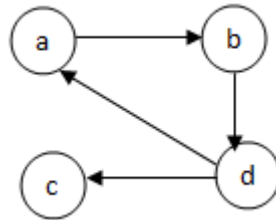
Q.8 a. Explain the concept of Dynamic programming using coin row problem **(6)**

b. Define B-tree. Create a B-Tree of order 4 with the following operation
Insert: 5, 3, 21, 9, 1, 13, 2, 7, 10, 12, 4, 8 **(10)**

Q.9 a. Explain the Dijkstra Algorithm for Single source shortest path. **(6)**

b. Using branch and bound method solve the following scheduling problem **(10)**

Jobs	1	2	3	4
p_j	4	2	6	5
d_j	8	12	11	10
r_j	0	1	3	5