BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BE
BRANCH: CSE

SEMESTER : III
SESSION : MO/16

SUBJECT: CS6101-DESIGN AND ANALYSIS OF COMPUTER ALGORITHM

TIME: 03:00

FULL MARKS: 60

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
6. Nothing should be written on front or back of the question paper except tick marking.

Q.1(a) Write the following algorithm in an improved way. [2]

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For (I = 1 to n)
If (I < j) then Sum = Sum + nums[i];
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(b) Solve the recurrence $T(n) = 2T(\sqrt{n}) + \log n$ [4]

(c) Compare the time complexities of the deterministic and the randomized versions of Quicksort. [6]

Q.2(a) Write the recursive function of the Tower of Hanoi problem and determine its time complexity. [2]

(b) Outline divide and conquer based algorithm for finding maximum and minimum of a list and discuss its time complexity. [4]

(c) Write a recursive version of Mergesort in which the input list is divided in two parts such that one is twice in length than the other. Determine the time complexity of the algorithm [6]

Q.3(a) Compare and contrast 'feasible solution' and 'optimal solution' with help of a suitable example. [2]

(b) Let G(V,E) be any weighted connected graph. If C is any cycle of G, then show that the heaviest edge of C cannot belong to a minimum-cost spanning tree of G. [4]

(c) Find the time-complexity of Prim's algorithm for minimum cost spanning tree. Prove the optimality of Prim's algorithm. [6]

Q.4(a) Discuss the principle of optimality [2]

(b) Solve the all-pair-shortest-path problem for the adjacency matrix given below using dynamic programming: [4]

$$\begin{bmatrix} 0 & 3 & 8 & \infty \\ \infty & 0 & 4 & 11 \\ \infty & \infty & 0 & 7 \\ 4 & \infty & \infty & 0 \end{bmatrix}$$

]

(c) Illustrate the dynamic programming solution to determine optimal binary search tree and comment on time complexity of the algorithm. [6]

Q.5(a) Discuss the condition of valid placing of a queen for N queen problem. [2]

(b) Write algorithm and discuss complexity for the solution of N queen problem using backtracking. [4]

(c) Let w = { 5,7,10,12,15,18,20} and m =35 . Find all possible subsets of w that sum to m. Draw the portion of state space tree that is generated. [6]

Q.6(a) Define LC and FIFO branch and bound method. [2]

(b) Obtain the reduced cost matrix of the following cost matrix [4]

-	7	3	12	8
3	-	6	14	9
5	8	-	6	18
9	3	5	-	11
18	14	9	8	-

(c) Discuss the efficiency consideration related queries of branch and bound method. [6]

Q.7(a) Differentiate between NP, NP- complete and NP-hard. [2]

(b) Justify whether the knapsack problem is NP-complete. [4]

(c) Compare the characteristic features of the Las Vegas and Monte Carlo algorithms with an example for each. [6]

*****23/11/16******E