Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(CSE)/SEM-1/CST-612/2011-12

2011

ADVANCED ALGORITHM & DBMS

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

Question No. 1 is compulsory and answer any *two* of the rest.

1. Explain why the statement, "The running time of algorithm A is at least $O(n^2)$" is meaningless. 5

2. a) Solve the following Recurrence relation using Master's Theorem : 6

   i) $T(n) = 2T(n/2) + n$

   ii) $T(n) = 7T(n/3) + n^2$

   iii) $T(n) = 4T(n/2) + n$.

   b) Using the algorithm and mathematical example, prove that Fractional Knapsack problem has the Greedy choice property. 9

3. a) Prove that the total running time of BFS is $O(V + E)$. Satisfy your answer with example. 6

   b) Show that for each minimum spanning tree T of G, there is a way to sort the edges of G in Kruskal's algorithm so that the algorithm returns T. 9

4. a) Dijkstra's algorithm always chooses "lightest" and "closest" vertex in V-S to add to set S. Explain. 5

   b) Given a weighted, directed graph $G = (V, E)$ with no negative weight cycles, let m be the maximum overall pairs of vertices $u, v \in V$ of the minimum number of edges in a shortest path from u to v (shortest path is by weight not the number of edges). Suggest a simple change to the Bellman-Ford algorithm that allows it to terminate in $m + 1$ passes. 10

5. a) Explain Travelling saleman problem with example. 6

   b) Compare Greedy and Dynamic programming approach with example. 9

GROUP – B

Question No. 6 is compulsory and answer any *two* of the rest.

6. Find the prime and non-prime attributes from the following schema.

   Report (S#,C#,StudentName,DateOfBirth,CourseName, PreRequisite,DurationInDays,DateofExam, Marks,Grade).

   What do you mean by composite and simple attribute ? 5

7. a) Write ACID properties of Transaction Management System. Write a pair of transaction and check the ACID properties.

   b) Define Homogeneous DDBMS and Heterogeneous DDBMS. 10 + 5

8. a) Differentiate between the following :

   Relation satisfying a Functional Dependency and Functional Dependency holding on a Relation.

   b) Compute the closure of the following set F of functional dependencies for relation schema $R = \{A, B, C, D, E\}$

   $A \varnothing BC$

   $CD \varnothing E$

   $B \varnothing D$

   $E \varnothing A$

   c) List the candidate keys for R. Find F_c . 5 + 5 + 5

9. a) Why is a serializable schedule considered correct ? What is the difference between conflict equivalence and view equivalence ?

   b) Every conflict serializable schedule is view serializable schedule. Explain it with an example.

   c) How is precedence graph used for testing Serializability ? Explain with an example. 5 + 5 + 5

10. a) Define MVD with suitable example.

    b) Consider the following Employee table :

ENAME	PNAME	DNAME
Kumar	X	Rakesh
Kumar	Y	Rao
Kumar	X	Rao
Kumar	Y	Rakesh

    Check the Employee table is in 4NF or not. If yes, write the reason and if not derive the table in 4NF.

    c) What is PJNF ? 5 + 5 + 5