ROLL NO. _____

Code: AC10 **Subject: DISCRETE STRUCTURES**

AMIETE – CS (OLD SCHEME)

Time: 3 Hours **JUNE 2012** **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. If A = {x| 3 < x < 5} and B = {y| 5< y < 10} then A ∩ B is equal to

(A) {5} **(B)** { }
(C) {x | 3 < x < 10} **(D)** {3, 5, 10}

b. Determinant of an Identity matrix of order 4 x 4 is _____.

(A) 16 **(B)** 0
(C) 4 **(D)** 1

c. A bag contains 15 pencils. These pencils are of four different colors. How many pencils must be of same colors?

(A) 4 **(B)** 5
(C) 3 **(D)** 2

d. A graph is called bi-connected if number of articulation point in it is equal to _____.

(A) 3 **(B)** 2
(C) 0 **(D)** 1

e. Sum of rational and an irrational number is irrational can be proved using

(A) Direct proof. **(B)** Method of contradiction.
(C) Mathematical Induction. **(D)** Method of contra positive.

f. An asymmetric relation is not

(A) Symmetric **(B)** Anti -symmetric
(C) Reflexive **(D)** Symmetric & Reflexive

g. Which is not true about a bounded lattice?

(A) It is always distributive **(B)** Zero and Unit element Exist
(C) It has a least element **(D)** It has a greatest element

h. $p \rightarrow q \leftrightarrow \sim p \vee q$ is a

(A) Contradiction **(B)** Contingency
(C) Tautology **(D)** Nothing can be said

i. Which of the following is not true about a tree?

(A) A tree is a connected graph
(B) A tree is acyclic
(C) It is 1-seperable
(D) There are multiple paths from root to a node.

j. A FSM recognizes a language of the following types

(A) Type 1 **(B)** Type 0
(C) Type 3 **(D)** Type 2

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

Q.2 a. Find the sum of the following series
$1*(1/2)+2*(1/2)^2+3*(1/2)^3+\ldots\ldots..$ **(8)**

b. Given that f and g are two functions defined over set of real numbers R as $f(x) = 1+x$ and $g(x) = 1 - x$ then find fof, fog, gof and gog. **(8)**

Q.3 a. Using mathematical induction method, prove that $2^{2n+1}+3^{2n+1}$ is divisible by 5 for any $n \in N$. **(8)**

b. Read the following paragraph. Covert it into prepositional expression and show that the conclusion is true.
"Ram is a student and he is sincere. Every sincere student excels in the class. Shyam is also a sincere student. Therefore Ram and Shyam both excel in their class." **(8)**

Q.4 a. Solve the following recurrence equation:
$a_n + 3\,a_{n-1} = n + 1$ where $a_0 = 1$ **(8)**

b. A group of people contains 15 male and 7 female. Ramu, a male and Shyamala, a female are also in that group. A committee is to be formed of seven people containing 4 males and 3 females. What is probability that a committee formed of seven people will contain both Ramu and Shyamala? **(8)**

Q.5 a. Find the number of edges in the following graphs:
Complete Graph (K_n), 5-Regular graph in n nodes, Complete bipartite graph ($K_{m, n}$) and N-Cube graph. **(8)**

b. Write Warshall's algorithm for finding transitive closure of a relation. **(8)**

Q.6 a. Show that if a relation R defined on a set A is symmetric and transitive then R is not irreflexive. **(8)**

b. Given that $A = \{x \mid 0 < x \leq 1\}$ then show that $(A, \leq)$ is an unbounded lattice. **(8)**

Q.7 a. Define prime implicant and minimize the following Boolean expression using Karnaugh Map

$$x' + xy + xyz + xy'z$$ **(8)**

b. Draw logic circuit diagram for Boolean function
$F(x, y, z) = x \vee (x \wedge (y \vee z)) \wedge (x' \vee y)$ **(8)**

Q.8 a. Draw an expression tree for the infix expression 2 + {3 – (4 + 5) / 3 * 4} +23. Then traverse the tree in preorder and postorder and verify that the expressions so obtained are prefix and postfix notation respectively of the above expression. **(8)**

b. Draw a finite state machine to recognize a regular expression a*(a+b)aab. Write its state transition table as well. **(8)**

Q.9 Write short notes on **TWO** of the followings:

(i) Krushkal's algorithm
(ii) Equivalence Relation
(iii) Bounding elements in a poset **(8+8)**