CBA-255-T

M.C.A. First Semester

(End Semester)

Examination Dec., 2018

COMPUTER SCIENCE AND APPLICATIONS

Paper - CSA-CC-125

(Discrete Mathematics)

Time: Three Hours]

[Maximum Marks : 60

Note: Attempt all sections A, B and C. Follow the instructions given in each section.

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Section-A

(Objective Type Questions) $10 \times 1 = 10$

Note: - Attempt all question and in each question select the correct option.

- 1. (i) Range of a function is:
 - (a) The maximal set of numbers for which function is defined
 - (b) The maximal set of numbers which a function can take values
 - (c) It is set of natural number for which a function is defined
 - (d) None of the mentioned
 - (ii) In which of the following sets A-B is equal to B-A

(a)
$$A = \{1,2,3\}, B = \{2,3,4\}$$

(b)
$$A = \{1,2,3\}, B = \{1,2,3,4\}$$

$$(c) A = \{1,2,3\}, B = \{2,3,1\}$$

(d)
$$A = \{1,2,3,4,5,6\}, B = \{2,3,4,5,1\}$$

- (iii) The set of all real numbers under the usual multiplication operation is not a group since
 - (a) multiplication is not a binary operation
 - (b) multiplication is not associative
 - (c) identity element does not exist
- (d) zero has no inverse
- (iv) The sum of the entries in the fourth row of Pascal's triangle is
 - (a) 8

a

- (b) 4
- (c) 10
- (d) 16
- (v) A polygon with 7 sides can be triangulated into
 - (a) 7
 - (b) 14
 - (c)5
 - (d) 10

- (vi) Hasse diagram are drawn
 - (a) Partially ordered sets
 - (b) Lattices
 - (c) Boolean algebra
 - (d) None of these
- (vii) Let P:I am in Bangalore., Q: I loved cricket.; then $q \rightarrow p(q \text{ implies p})$ is:
 - (a) If I am in Bangalore then I love cricket
 - (b) I am not in Bangalore
 - (c) I Love cricket
 - (d) If I love cricket then I am in Banglore
- (viii) A compound proposition that is neither a tautology nor a contradiction is called
 - (a) Condition
 - (b) Inference
 - (c) Contingency
 - (d) Equivalence

- (ix) In any undirected graph the sum of degrees of all the nodes
 - (a) Must be even
 - (b) Are twice the number of edges
 - (c) Must be odd
 - (d) Need not be even
- (x) A graph with n verticles will definitely have a parallel edge or self loop if the total number of edges are
 - (a) greater than n-1
 - (b) less than n (n-1)
 - (c) greater than n(n-1)/2
 - (d) less than $(n^3)/2$

Section 'B'

(Short Answer Type Questions) 4×5=20

Note: - Attempt all four questions. Each question carries five marks.

- Define Relation, Function and Recursive function with suitable example.
- Define Group and prove that the Set $S = \{1, -1, i, -i\}$ is a group under the operation multiplication.

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- Consider the set A = {1,2,3,400}. Find the number of integers in set A which are neither divisible by 3 nor by 7.
- Define lattice and bounded lattice. Give the properties of lattice.
 - 5. Establish the equivalence:

$$(p \Rightarrow q) \land (r \Rightarrow q) \equiv (p \Rightarrow q) \Rightarrow q$$

Define Graph, Bipartite Graph, Euler path and Hamiltonian path.

Section 'C'

(Long Answer Type Questions) 3×10=30

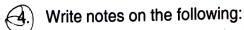
Note: Attempt any three questions. Each question carries ten marks.

- Describe the method of mathematical induction. Show that $1^3 + 2^3 + \dots + n^3 = (1+2+\dots+n)^2$ using mathematical induction for $n \ge 1$.
 - 2. What is recurrence relation? What you understand by solving recurrence relation? Solve the following recurrence relation.

$$g(n) = g(n-1) + 2n-1$$

$$g\left(0\right) =0.$$

State and verify Absorption Laws. Reduce the following Boolean expression using K-Map: F (U, V, W,Z) = {(0,1,2,4,5,14,15}



- (a) Tautology and Contradiction
- (b) First Order Predicate
- (c) Quantifiers

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- (d) Inference theory
- What are Binary Tree and Binary search Tree? Write code for in order, pre-order and post-order traversal of binary tree. Explain with an example the binary tree in order, pre-order and post-order.