Q.3 Write the following functions into conjunctive normal form, in which maximum number of variables are used :

(i) $f(x,y,z)=xy'+xz+xy,$

(ii) $(x+y+z)(xy+x'z)'.$

OR

Change the following functions to disjunctive normal froms of three variable x,y,z :

(i) $x+y',$

(ii) $x'z+xz',$

(iii) $(x+y)(x'+y').$

Q.4 Show that the relation "$xRy \Leftrightarrow x-y$ is divisible by 5" where $x,y \in I$ defined in the set of integers I is an equivalence relation.

OR

If R is an equivalence relation in the set A, then prove that R^{-1} is aslo an equivalence relation in the set A.

Q.5 If a graph $G=(V,E)$ is defined by

$$V=\{v_1,v_2,v_3,v_4,v_5\}$$

$$E=\{(v_1,v_2)(v_1,v_3)(v_2,v_3)(v_2,v_4)(v_3,v_4)(v_3,v_5)(v_4,v_5)\}$$

$$|V|=5 \qquad |E|=7.$$

Find adjacency and incidence matrix of the graph.

OR

State and prove Euler's formula for a planer graph.

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Roll No.....

Total No. of Sections : 03

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Annual Examination - 2020

BCA Part - I

BCA - 101

THEORETICAL FOUNDATION OF COMPUTER SCIENCE

DISCRETE MATHEMATICS

Time : 3 Hrs. Max.Marks : 80

Min.Marks : 27

Note : Section 'A', containing 10 very short-answer-type questions, is compulsory. Section 'B' consists of short answer type questions and Section 'C' consists of long answer type questions. Section 'A' has to be solved first.

Section - 'A'

Answer the following very short-answer-type questions in one or two sentences : **(2×10=20)**

Q.1 Define contradiction.

Q.2 Write De-Morgan's law.

Q.3 Define Delta Circuit.

Q.4 Draw the switching circuits for the following Boolean function : $x \cdot z+z \cdot t.$

Q.5 Simplify the following :

$$\sim(p \vee \theta) \vee (\sim p \vee \theta)$$

Q.6 Give example of Quotient set.

Q.7 Define Walk.

Q.8 Draw the all simple graphs of two and four vertices.

Q.9 Show that $p \vee (\sim p)$ is a tautology.

Q.10 Define Minimal Boolean function.

Section - 'B'

Answer the following long answer type questins in word limit 150-200 : **(4×5=20)**

Q.1 Prove that the following statement are logically equivalent :

$$p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$$

OR

Prove that $(p \Leftrightarrow q) \wedge (q \Leftrightarrow r) \Rightarrow (p \Leftrightarrow r)$ is a tautology.

Q.2 Draw the switching circuits of the following function and repels them by simpler ones :

$$F(x, y, z) = (x + y + z)\cdot(x' + y).$$

OR

In a Boolean algebra $(B, \vee, \wedge, ')$, prove that the following :

$$(x' \wedge y') \vee (x' \wedge y') = 1$$

Q.3 Find complete disjunctive normal form in three variable, and show that its value is 1.

OR

Express the following algebric expressions in binary trees :

$$(((a \times b) + c) - d) \times (e + f).$$

Q.4 Find domain and range of the relation :

$$R = \{(x, y) : x, y \in N \text{ and } x + y = 8\}.$$

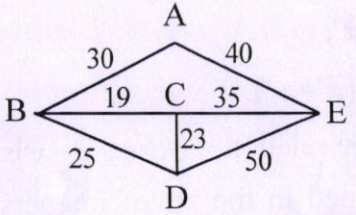
OR

If I is the set of integers and the relation $xRy \Rightarrow x - y$ is an even integer, then prove that R is an equivalence relation, where $x, y \in I$.

Q.5 Find the minimum height of a binary tree with 9 vertices.

OR

Solve the travelling salesman problem for following graph :



Section - 'C'

Answer the following long answer type questins in word limit 300-350 : **(8x5=40)**

Q.1 Prove that : $(p \wedge q) \wedge r \Leftrightarrow p \wedge (q \wedge r)$.

OR

Prove that the following statements are logically equivalent :

$$p \Rightarrow (q \wedge r) \equiv (p \Rightarrow q) \wedge (p \Rightarrow r).$$

Q.2 In a Boolean algebra $(B, \wedge, \vee, ')$, prove that the following :

a) $(x' \wedge y') \vee (x' \wedge y') = 1$

b) $(a \wedge b) \vee [(a \vee b') \wedge b]' = 1$

OR

Draw a circuit for the following function and replace it by a simpler one :

$$F(x, y, z) = x \cdot z + \left[y \cdot (y' + z) \cdot (x' + x \cdot z') \right].$$

P.T.O.