Roll No. .... Total No. of Sections : 3

Total No. of Printed Pages : 6

Annual Online Examination 2021

Code No. : A.B.C-191

B.C.A. Part I

DISCRETE MATHEMATICS

Paper I

[Theoretical Foundation of Computer Science]

Time : Three Hours] [Maximum Marks : 50

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. **1×10=10**

1. Define Tautology.
2. Write Idempotent law.
3. Define Wye circuit.
4. Draw the switching circuit for the following Boolean function :

$$[(a + b)\cdot[a' + (c\cdot b')].$$

5. Simplify the following :

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

6. Define partitions set.
7. Define Path.
8. Draw all simple graphs of one, two and three vertices.
9. Show that $p \wedge (\sim p)$ is a contradiction.
10. State Bools theorem.

Section 'B'

Answer the following short answer type questions with word limit 150-200. **3×5=15**

1. Prove that following statements are logically equivalent :

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

Or

Prove that $(p \vee q) \wedge (\sim p) \wedge (\sim q)$ is a contradiction.

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

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

Or

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

$$a \vee [(a' \wedge c) \vee p] = (a \vee b) \vee c.$$

3. Find complete disjunctive normal form in two variable x_1, x_2 and show that its value is 1.

Or

Express the following algebric expressions in binary trees :

$$(x - y) + ((y + z) + w).$$

4. If N is a natural numbers, them what is the domain of the relation R = $\{(x, y) : x + 7 = 7\}$, where $x, y \in$ N.

Or

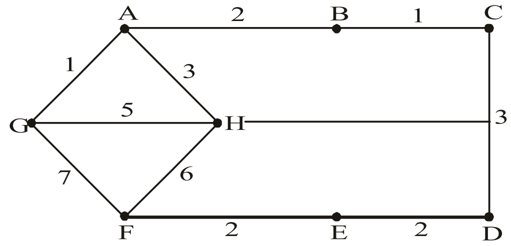
Prove that the relation "is congruent to" in the set of all coplaner triangles is an equivalence relation.

5. Prove that if the number of vertex is n a binary tree then n is odd.

Code No. : A.B.C-191

Or

Solve the travelling salesman problem for the following weighted graph :



Section 'C'

Answer the following Long Answer Type Questions.

5 × 5 = 25

1. Prove that :

$$(p \vee q) \vee r \Leftrightarrow p \vee (q \vee r).$$

Or

Prove the following statement are logically equivalent :

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

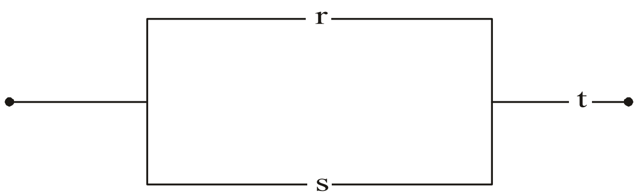
2. In a Boolean algebra (B, $\vee$, $\wedge$, $'$) prove that the following :

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

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

Or

Show that the Boolean function $r{\cdot}t + [s{\cdot}(s' + t){\cdot}\{r' + (s{\cdot}t)\}]$ replaced by following net :



3. Write the following functions into conjunctive forms in three variable x, y, z :

(i) $x + y'$,

(ii) $(x + y)\,(x' + y')$,

(iii) x.

Or

Express the following functions into disjunctive normal form :

(i) $f\,(x, y) = x + x'{\cdot}y$,

(ii) $f\,(x, y, z) = x{\cdot}y' + x{\cdot}z + x{\cdot}y$.

4. If I is the set of non-zero integers and a relation R is defined by $x\mathrm{R}y$ if $x^y = y^x$, where $x, y \in \mathrm{I}$, then is the relation R an equivalence relation ?

Code No. : A.B.C-191

Or

If R and S be equivalence relations in the set X, then prove that $\mathrm{R} \cap \mathrm{S}$ is an equivalence relation in X.

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

$$\mathrm{V} = \{v_1, v_2, v_3\};\ \mathrm{E} = \{(v_1, v_2), (v_2, v_3), (v_1, v_3)\}$$

$$|\,\mathrm{V}\,| = 3,\ |\,\mathrm{E}\,| = 3$$

then find the adjacency matrix and the incidence matrics of the graph G.

Or

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