



BRAINWARE UNIVERSITY

Term End Examination 2022

Programme – MCA-2022

Course Name – Mathematical Foundation for Computer Science

Course Code - MCA104

(Semester I)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

(i) Let p: It is cold and q: It is raining , then identify the symbolic form of the statement ‘It is cold or it is not raining’ is

- a) $p \vee q$
- b) $\neg p \vee q$
- c) $\neg p \wedge q$
- d) $p \vee \neg q$

(ii) Let p: It is cold and q : It is raining , then identify the symbolic form of the statement ‘It is not raining and it is not cold’

- a) $\neg q \wedge p$
- b) $\neg q \wedge \neg p$
- c) $\neg(q \wedge p)$
- d) None of these

(iii) If $f: A \rightarrow \delta$ μ where $B = \{0, 1, 4, 9\}$ and f is defined by the rule $\delta \rightarrow \delta^2$. Identify for which set A is the one-to-one function

- a) $\{-1,0,1,2\}$
- b) $\{-3,-1,0,2,3\}$
- c) $\{-2,0,-1,2\}$
- d) $\{0,1,2,3\}$

(iv) Identify the correct option: In a graph if $e=[u, v]$, Then u and v are called

- a) Endpoints of e
- b) Neighbors
- c) Adjacent nodes
- d) All of these

(v) Choose the correct answer: A graph with no circuit and no parallel edges is called

- a) Multi graph
- b) Pseudo graph
- c) Simple graph
- d) None of these

(vi) If a graph has 6 vertices and 15 edges then write down the size of its adjacency matrix is

- a) 6X6
- b) 6X15
- c) 15X6
- d) 15X15

(vii) Choose the correct option: Number of edges in a complete graph with n-vertices is:

- a) ${}^n C_1$
- b) ${}^n C_2$
- c) ${}^n C_3$
- d) ${}^n C_n$

4. Explain infimum and supremum for a poset. (3)

OR

Explain join and meet for a poset (3)

5. Calculate the number of committees of 2 boys and 3 girls that can be formed out of 7 boys (3) and 6 girls.

OR

Illustrate that the sum of the degree of all vertices in a graph is twice the number of edges (3) in the graph

6. Relation R is defined on integers and $R = \{a-b \text{ is divisible by } 10 \text{ where } a \text{ and } b \text{ are integers}\}$. Test whether R is an equivalence relation. (3)

OR

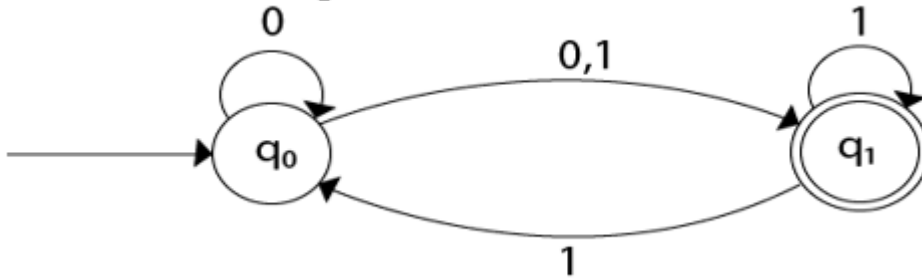
Solve the minimum number of edges necessary in a simple planar graph with 15 regions. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. Evaluate DFA from the given NFA. (5)

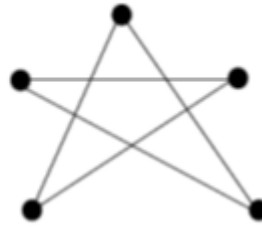
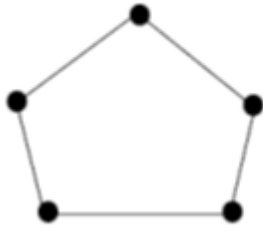


8. Examine if \sim is an equivalence relation on \mathbb{Z} , where relation \sim is defined on a set \mathbb{Z} by “ $a \sim b$ if and only if $a-b$ is divisible by 5” for $a, b \in \mathbb{Z}$. (5)

OR

(5)

Examine whether the following two graphs are isomorphic or not.



9. If R is a relation defined by (5)
 $R = \{(x, y) : x - y \text{ is divisible by } 7\}$
 Show that R is an equivalence relation.

OR

Explain the Konigsberg Bridge Problem and its solution. (5)

10. Develop the following by using mathematical induction: (5)
 $1(1!) + 2(2!) + 3(3!) + \dots + n(n!) = (n + 1)! - 1$

OR

Determine the truth value of the quantifier $\exists x, x^2 - 2x + 5 = 0$; set of all real numbers being the domain. (5)

11. Without using truth table, Justify that $\neg(P \vee Q) \vee (\neg P \wedge Q) \vee P$ is a tautology. (5)

OR

Evaluate an NFA with $\Sigma = \{0, 1\}$ in which double '1' is followed by double '0' (5)

12. Explain the truth value of the universal quantifier of the propositional function $P(x, y)$ stating " $x^2 + y^2 < 12$ " and the domain is $\{1, 2, 3\}$. (5)

OR

Compare between Mealy M/C and Moore M/C. (5)
