

(viii) Choose the correct option: The root of a binary tree is the vertex having degree

- a) 1
b) 2
c) 3
d) 4

(ix) Write down the operation in which NFA is not closed

- a) Negation
b) Kleene
c) Concatenation
d) none of these

(x) Choose the correct statement

- a) All NFAs are DFAs
b) All NFAs are not DFAs
c) both a and b
d) None of these

(xi) Select the right option: For a give Moore Machine, Given Input='101010', thus the output would be of length:

- a) $|Input|+1$
b) $|Input|$
c) $|Input-1|$
d) Cannot be predicted

(xii) The Grammar can be defined as: $G=(V, \Sigma, p, S)$. In the given definition, what does S represents?

- a) Accepting State
b) Starting Variable

- c) Sensitive Grammar
d) None of these

(xiii) Choose the right option: The set $(A \cup B \cup C) \cap (B \cup C)$ equals to

- a) $B \cap C'$
b) $B \cup C$
c) $A \cap C$
d) $A \cap B' \cap C'$

(xiv) Let $A = \{(x, y) : y = 2x + 5, x \in R\}$, $B = \{(x, y) : y = 4x + 9, x \in R\}$ then select the right option

- a) $A \cap B = \emptyset$
b) $A \cap B \neq \emptyset$
c) $A \cup B = R$
d) $A \cup B = A$

(xv) How many symmetric relations are possible on a set with n elements? Select the right option

- a) 2^n
b) $2^{n(n-1)}$
c) $2^{n(n+1)/2}$
d) 2^{n+2}

Group-B

(Short Answer Type Questions)

3 x 5=15

2. In (D60,|) compute the join and meet of 6 and 10.

(3)

3. Differentiate between one-to-one and many-to-one mapping.

(3)

OR

Show that the number of ways in which 7 different beads can be arranged to form a necklace is 360.

(3)

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

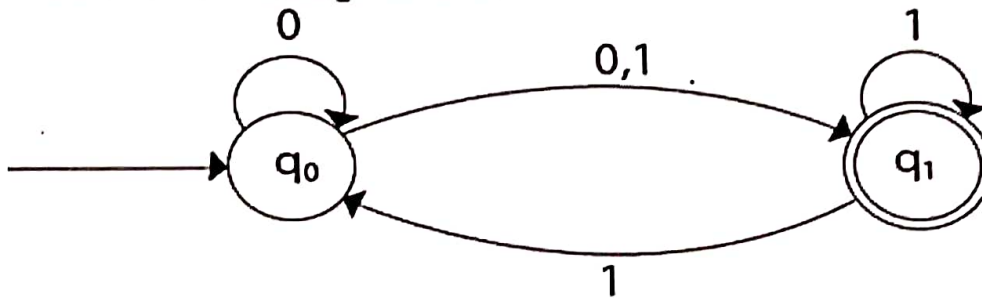
Solve the minimum number of edges necessary in a simple planar graph with 15 regions. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

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

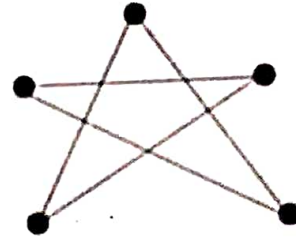
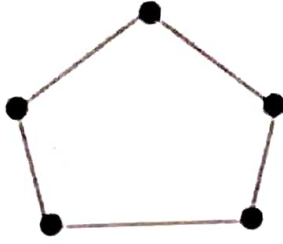


8. Examine if \sim is an equivalence relation on \mathbb{Z} , where relation \sim is defined on a set \mathbb{Z} by “ $a \sim b$ if and only if $a-b$ is divisible by 5” for $a, b \in \mathbb{Z}$. (5)

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)
