



BRAINWARE UNIVERSITY

Term End Examination 2022 Programme – MCA-2022 Course Name – Mathematical Foundation for Computer Science Course Code - MCA104

b) $\neg p \lor q$

(Semester I)

Full Marks: 60

[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

c) ¬p ∧q
d) p ∨ ¬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) $\neg q \land p$ b) $\neg q \land \neg p$ c) $\neg (q \land p)$ d) None of these

(iii) If $f: A \to \eth$ μ where $B = \{0, 1, 4, 9\}$ and f is defined by the rule \eth "(\eth ' Ψ) = \eth ' Ψ 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}

a) $P \vee q$

(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) ${}^{n}C_{n}$

(VIII)) Choose the correct option: The ro	oot of a binary tree is the vertex having degree	
	a) 1	b) 2	
	c) 3	d) 4	
(ix)	Write down the operation in which	h 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)	output would be of length:	Moore Machine, Given Input='101010', thus the	
	a) Input +1	b) Input	
	c)	d) Cannot be predicted	
	Input-1		
(xii)	The Grammar can be defined as: 0 represents?	$G=(V, \sum, p, S)$. In the given definition, what does S	
	•		
	a)	b) Starting Variable	
	Accepting State		
	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 $A = \{(x, y) : y = 2x + 5, x \in \mathbb{R} \}$ option	$\{R\}, B = \{(x, y): y = 4x + 9, x \in R\} \text{ then select the right}$	ht
	a) $A \cap B = \varphi$	b) $A \cap B \neq \varphi$	
	c) $A \cup B = R$	d) $A \cup B = A$	
(xv)		e possible on a set with n elements? Select the right	
(,,,,	option	1	
	a) 2 ⁿ	b) $2^{n(n-1)}$	
	c) $2^{n(n+1)/2}$	d) 2 ⁿ⁺²	
	, 2		
		Group-B	
	(Sho	ort Answer Type Questions)	3 x 5=1
2. In	(D60,) compute the join and meet	t of 6 and 10.	(3)
3. D	ifferentiate between one-to-one and	d many-to-one mapping.	(3)
		OR	
	now that the number of ways in whe cklace is 360.	ich 7 different beads can be arranged to form a	(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 is divisible by 10 where a and b are (3) integers). Test whether R is an equivalence relation.

OR

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

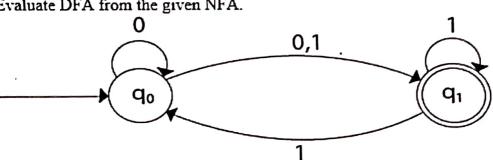
Group-C

(Long Answer Type Questions)

5 x 6=30

(5)

Evaluate DFA from the given NFA. 7.

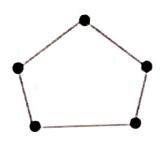


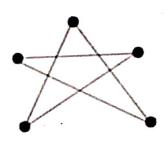
8. Examine if is an equivalence relation on \mathbb{Z} , where relation is defined on a set \mathbb{Z} by "a b (5) if and only if a-b is divisible by 5" for a,b \mathbb{Z} .

OR

(5)

Examine whether the following two graphs are isomorphic or not.





If R is a relation defined by

$$R = \{(x, y): x - y \text{ is divisible by 7}\}$$

Show that R is an equivalence relation.

OR

Explain the Konigsberg Bridge Problem and its solution.

(5)

(5)

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

(5)

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 $\neg (P \lor Q) \lor (\neg P \land Q) \lor P$ is a tautology.

(5)

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)