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MCS-013

MASTER OF COMPUTER APPLICATION (REVISED)/ BACHELOR OF COMPUTER APPLICATION (REVISED) (MCA/BCA)

Term-End Examination

June, 2024

MCS-013 : DISCRETE MATHEMATICS

Time : 2 Hours *Maximum Marks : 50*

Note : *Question* ***No. 1*** *is compulsory. Attempt any* ***three*** *questions from the rest.*

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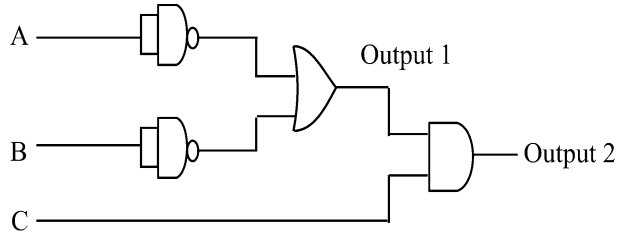
1. (a) Using truth table, show that : 2

$$\sim (p \rightarrow q) \equiv p \wedge \sim q$$

(b) Prove that : 2

$$(A - B) \cup B = A \cup B$$

(c) Find the Boolean expression for the outputs of the following circuit : 2



(d) Make Venn diagram for the following set of expressions : 2

(i) $A \cap B \cap C$

(ii) $A \cup B - C$

(e) Find the domain for which the function : 2

$$f(x) = 3x^2 - 1$$

and

$$g(x) = 1 - 5x$$

are not equal.

(f) A coin is tossed n times. What is the probability of getting r heads ? 2

(g) Prove the following : 2

$$\sim (\forall_x \, P(x)) \equiv \exists_x (\sim P(x))$$

(h) If : 2

$$f = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{bmatrix}$$

and

$$g = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{bmatrix},$$

find f o g and g o f.

(i) Use mathematical induction to prove : 2

$$\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + ... + \frac{1}{n \times (n+1)} = \frac{n}{n+1}.$$

(j) How many different strings can be made from the letters of the word 'SUCCESS', using all the letters ? 2

2. (a) Let R be the relation on the set of strings of Hindi letters such that aRb iff $l(a) = l(b)$, where $l(x)$ is length of string x. Show that R is an equivalence relation. 5

   (b) Write contrapositive, converse and the inverse of the implication "the home team does not win whenever it is raining." 3

   (c) Make Pascal's triangle upto $n = 6$. 2

3. (a) Compare conjunctive normal form and disjunctive normal form. Give suitable example for each. 5

   (b) Construct the logic circuit for the following Boolean expressions : 5

   (i) $(a \wedge b \wedge c) \vee (b \wedge c)' \vee (a \wedge b)'$

   (ii) $(a' \wedge b') \vee (b' \wedge c) \vee d$

4. (a) If : 2

$$2\mathrm{P}(n, 2) + 50 = \mathrm{P}(2n, 2)$$

   then find n.

(b) Find in how many ways can 25 identical books be placed in 5 identical boxes. 3

(c) Write short notes on any *two* of the following : 5

(i) Modus-Tollens

(ii) Syllogism

(iii) Contrapositive

5. (a) If there are 12 persons in the party, and if each two of them shake hands with each other, how many handshakes happen in the party ? 3

(b) Prove that : 2

$$A - (A - B) \equiv A \cap B$$

using Venn diagram.

(c) Reduce the following expression to the simpler form : 2

$$F(a, b) = (a' \wedge b') \vee (a' \wedge b) \vee (a \wedge b')$$

(d) If : 3

$$P(X) = 0.25,$$

$$P(Y) = 0.4$$

and $P(X \cup Y) = 0.5$,

then determine :

(i) $P(X \cap Y)$

(ii) $P(X \cap Y')$