

**MCA (Revised) / BCA (Revised)**

**Term-End Examination**

**June, 2022**

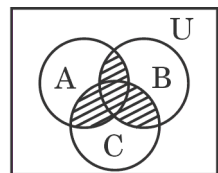
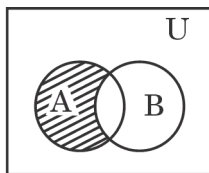
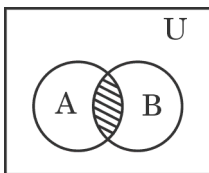
**MCS-013 : DISCRETE MATHEMATICS**

*Time : 2 hours*

*Maximum Marks : 50*

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

1. (a) Use pigeonhole principle to find the minimum number of cars that will have same colour; if 20 cars are painted using 6 colours. 2
- (b) Show that  $\sqrt{3}$  is irrational. 4
- (c) Draw the logic circuit for the following Boolean expression : 4
- $$(X_1 \wedge X_2 \vee X'_3) \vee (X'_1 \vee X'_2 \wedge X_3)$$
- (d) Write the set expression (shaded part) for the following Venn diagrams : 3



- (e) Write suitable mathematical statement that can be represented by  $(\forall x)(\forall y)(\exists z)P$ . 2
- (f) Disprove that  $(\forall a \in \mathbf{R})(\forall b \in \mathbf{R}) [(a^2 = b^2) \Rightarrow (a = b)]$ , using a counter-example. 2
- (g) There are 5 women and 6 men. A committee has to be formed of 3 people. In how many ways can this be done if at least one woman should be there in the committee? 3

2. (a) Prove using mathematical induction that

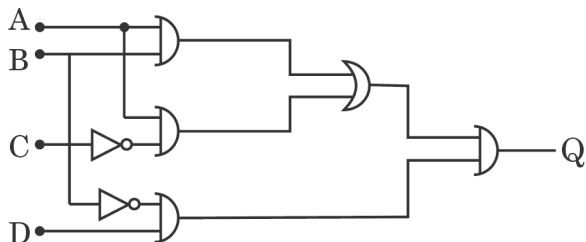
$$(1 + x)^n > 1 + nx \text{ for all } x > 0 \text{ and } n > 1. \quad 5$$

- (b) What is proper subset? Explain with the help of an example. 2
- (c) Show  $p \wedge (p \vee q) \leftrightarrow p$  is a tautology. 3

3. (a) Every function is a relation. Is every relation a function? Why? 3

(b) Explain circular permutation with the help of an example. 3

(c) Find the Boolean expression of Q in the logic circuit given below: 4



4. (a) If A and B are two mutually exclusive events such that  $P(A) = 0.4$  and  $P(B) = 0.2$ , what is the probability that either A or B does not occur ? 2
- (b) Give the geometric representation of  $\{3\} \times \mathbb{R}$ . 2
- (c) Present a direct proof of the statement “Square of an odd integer is odd.” 3
- (d) Find the inverse of the function
- $$f(x) = \frac{x - 4}{x - 3}. \quad 3$$
5. (a) Show that
- $$C(n, m) C(m, k) = C(n, k) C(n - k, m - k)$$
- for  $1 \leq k \leq m \leq n$ . 3
- (b) How many 3-letter words can be formed from the letters of the word “HAPPY” ? 2
- (c) What is contradiction ? Show whether  $p \wedge q \wedge \sim p$  is a contradiction or not. 3
- (d) Draw the Venn diagram for the expression
- $$A \cup B \cap C. \quad 2$$

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