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MCS-013

M. C. A. (REVISED)/B. C. A. (REVISED)

(MCA/BCA)

Term-End Examination

December, 2021

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) Explain if the following sentences are proposition or not and why : 4

   (i) Sun rises in the east.

   (ii) Prepare for your exam.

   (iii) Raju is 10-year old.

   (iv) How far is Mumbai from here ?

(b) Prove that : 4

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

using mathematical induction.

(c) What is a proper subset ? Explain with the help of a suitable example. 2

(d) Find number of integers between 100 and 999 consisting of distinct even digits. 2

(e) If $f(x) = x^3$ and $g(x) = (x^2 + 1) \forall x \in R$, where R is the set of real numbers.

Find : 3

(i) $(f \circ g)$

(ii) $(g \circ f)$

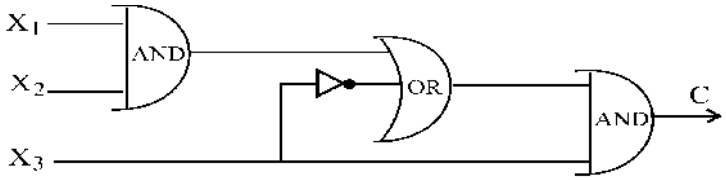
(iii) $(g \circ g)$

(f) Find the number of distinguishable words that can be framed from the letters of the word "UNIVERSITY". 2

(g) Find dual of $(A \cup B) \cap C$ and $(A \cap B) \cap C$. 3

2. (a) Show that $\sqrt{17}$ is irrational. 4

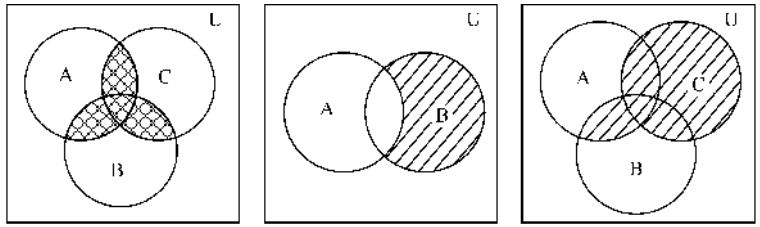
(b) Find the Boolean expression for the following logic circuit : 4



(c) Show that : 2

$$\sim (p \vee q) = \sim p \wedge \sim q$$

3. (a) Write the set expressions for the following Venn diagrams : 3



(b) Prove that : 3

$$^{n+1}C_r = {}^nC_{r-1} + {}^nC_r$$

(c) A die is rolled once. Find the probability of each of the following events : 4

(i) getting an odd number

(ii) getting at most 3

(iii) getting at least 3

(iv) getting at least 7

4. (a) Make truth table for the following : 2

$$p \rightarrow (\sim q \vee \sim r) \wedge (p \vee \sim r)$$

(b) Give geometric representation for the following : 2

$$R \times \{4\};$$

where R is a natural number.

(c) What is Relation ? Explain equivalence relation with the help of an example. 4

(d) State and explain Pigeonhole principle. 2

5. (a) Draw logic circuit for the following Boolean expression : 4

$$(X' + Y + Z) + (X + Y + Z') + (X'.Y)$$

(b) In how many ways 10 students can be grouped into 3 groups ? 3

(c) What is power set ? Find power set of set A = {1, 2, 4, 6}. 3