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MCS-013

**MASTER OF COMPUTER
APPLICATIONS (REVISED)/
BACHELOR OF COMPUTER
APPLICATIONS
(REVISED)**

Term-End Examination

June, 2026

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) Given : set $A = \{1, 2, 3, 4, 5\}$ and $B = \{2, 4, 6\}$. Verify :

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

Also draw the corresponding Venn diagram. 4

- (b) Let :

$$R = \{(x, y) \in Z \times Z : x < y\}.$$

Identify the domain and range of relation R . Also, explain the difference between relation and function with the help of an example of each. 4

- (c) Out of 10 boys and 5 girls, in how many ways you can select 5 children such that the group contains majority of boys. 4

- (d) Translate the following English sentence into a proposition : 4

“Every student in the class has taken the course OS (Operating System).”

- (e) Show that $\sqrt{17}$ is irrational. 4

2. (a) Show that :

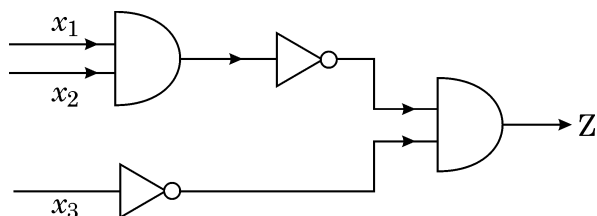
$$\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \dots + \frac{1}{n \times (n+1)} = \frac{n}{(n+1)}$$

using mathematical induction. 4

- (b) Every function is a relation. Is every relation a function ? Justify your answer. 3

- (c) Write and explain De Morgan's law with suitable truth-table. 3

3. (a) Find the Boolean expression for the output of logic circuit given below : 3



- (b) A survey of 500 television viewers produced the following information :
 285 viewed hockey games, 195 viewed football games, 115 viewed basketball games. 70 viewed both football and hockey games. 50 viewed both hockey and basketball games; and 30 viewed both football and hockey games. How many people viewed all the three games ? 5

- (c) Find the value of r if : 2

$${}^{20}C_r = {}^{20}C_{r-2}$$

4. (a) State the Pigeonhole principle. 2
- (b) Write and explain the expression for Modus Tollens and Modus Ponens with suitable example. 4
- (c) How many permutations are there in the word 'MISSISSIPPI', all letters of the word are taken together at a time. 4
5. (a) Verify that $(p \rightarrow r) \wedge (q \rightarrow r)$ and $(p \vee q) \rightarrow r$ are logically equivalent. 4
- (b) Let $f(x) = \frac{1}{x}$ and $g(x) = x^3 + 2$. 4

Find the following functions where $x \in \mathbb{R}$:

(i) $(f + g)x$

(ii) $(f - g)x$

(iii) $(fg)x$

(iv) $(f/g)x$

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

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