No. of Printed Pages : 3

MCS-013

MCA (Revised) / BCA (Revised)

Term-End Examination

00890

December, 2017

MCS-013 : DISCRETE MATHEMATICS

Time : 2 hours *Maximum Marks : 50*

Note : *Question number **1** is **compulsory**. Attempt any **three** questions from the rest.*

1. (a) Translate the statement

"The sum of two positive integers is positive" into a logical expression. *2*

(b) Write the negation of

"If x is an integer then x is a rational number." *2*

(c) Prove that if x^2 is an even integer, then x is an even integer by contraposition method. *3*

(d) Draw a Venn Diagram to show the following set operations : *3*

(i) $A - B$

(ii) $(A \cap B) \cup C$

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

(e) A box contains 5 balls. Find the number of ordered samples of size 2

(i) with replacement, and

(ii) without replacement. *4*

(f) Check whether the function $f(x) = x + 1$ is one-one or not. *2*

(g) How many numbers from 0 to 999 are not divisible by either 5 or 7 ? *4*

2. (a) A and B are mutually exclusive events such that $P(A) = 0{\cdot}3$ and $P(B) = 0{\cdot}4$. What is the probability that either A or B does not occur ? *3*

(b) How many six-digit numbers contain exactly three different digits ? *2*

(c) In how many ways can an employer distribute 100 one-rupee notes among 6 employees so that each gets at least one note ? *3*

(d) How many words can be formed from A, B, C, using the letter A thrice, the letter B twice and the letter C once ? *2*

3. (a) Explain Pascal's Triangle. *2*

(b) Given A = {1, 2, 3, 4} and Relation R as {(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)}. Examine whether R is

(i) Symmetric

(ii) Reflexive

(iii) Transitive *3*

(c) Let $f : R \to R$ defined by $f(x) = 3x - 4$. Find f^{-1}. 3

(d) Let $A = \{a, b, c, d\}$, $B = \{1, 2, 3\}$, $R = \{(a, 2), (b, 1), (c, 2), (d, 1)\}$. Is R a function ? Why ? 2

4. (a) Find CNF of $\sim (p \vee q) \leftrightarrow (p \wedge q)$. 4

(b) What is a proper subset ? Write the number of proper subsets of the set {a, b, c, d}. 3

(c) Draw the circuit for the following Boolean expression using logic gates

$Y = A'BC + A'BC' + ABC'$. 3

5. (a) Construct a truth table to check whether the following is a tautology or a contingency or a contradiction : 4

(i) $p \to (q \to p)$

(ii) $p \wedge (q \wedge \sim p)$

(b) 'If today is a holiday then I will go for a movie.' Write

(i) Inverse

(ii) Contrapositive 2

(c) Show that $n^2 > 2n + 1$ for $n \geq 3$ by Mathematical Induction. 4