No. of Printed Pages : 3

MCS-013

MCA (Revised) / BCA (Revised)

Term-End Examination

12165

June, 2018

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) How many three digit numbers are there with no digit repeated ? *2*

(b) Show that *2*

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

(c) Prove that *3*

$$ab + [c\,(a' + b')] = ab + c$$

(d) Find the domain for which the function $f(x) = 3x^2 - 1$ and $g(x) = 1 - 5x$ are equal. Also find a domain for which the functions are not equal. *4*

(e) Prove that 3

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

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

(g) Show that for integers greater than zero : 3

$$2^n >= n + 1$$

2. (a) Use mathematical induction method to prove that 4

$$1^2 + 2^2 + 3^2 + ... + n^2 = \frac{n(n+1)(2n+1)}{6}$$

(b) Draw Venn diagrams to represent the following for sets A, B and C. 4

(i) $A \Delta B$

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

(c) Find n if $2P(n, 2) + 50 = P(2n, 2)$. 2

3. (a) If $f : R \rightarrow R$ is a function such that $f(x) = 3x + 5$, prove that f is one-one onto. 4

(b) Show that $p \vee (q \wedge r) \Leftrightarrow (p \vee q) \wedge (p \vee r)$ is a tautology. 3

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

4. (a) Find the Boolean Expression for the given circuit. 3

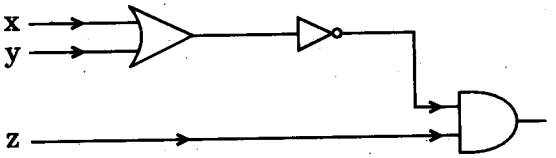

Figure 1

(b) Show whether $\sqrt{17}$ is rational or irrational. 4

(c) Prove that 3

$$p \Leftrightarrow q \equiv (p \Rightarrow q) \wedge (q \Rightarrow p).$$

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

(b) How many permutations are there of the letters, taken all at a time, of the word DISTINCT ? 3

(c) Show that in any group of 30 people, we can always find 5 people who were born on the same day of the week. 3

(d) Find how many 4 digit numbers are odd. 2