

GUJARAT TECHNOLOGICAL UNIVERSITY**MCA Integrated – SEMESTER – 1 • EXAMINATION – SUMMER 2018****Subject Code: 4410604****Date: 28-May-2018****Subject Name: Basic Mathematics for IT****Time: 10.30 am to 1.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Define the following terms **07**
1. Power Set
 2. Coinitial Vectors
 3. Proposition
 4. Circle
 5. Diagonal Matrix
 6. Modulus of a vector
 7. Equivalence Relation
- (b) I)** If $U = \{x/x \in \mathbb{N}, x \leq 10\}$ **04**
- $A = \{x/x \in \mathbb{N}, x \text{ is even integer}, 1 \leq x \leq 10\}$
- $B = \{2, 3, 5, 7\}$
- $C = \{1, 5, 6, 8, 10\}$
- Find (i) A' (ii) $A - B$ (iii) $A \cap (B' - C)$ (iv) $A - (B \cap C')$
- II)** Construct a truth table for each of following compound propositions. **03**
- (i) $p \rightarrow (\sim q \vee r)$
 - (ii) $(\sim p \leftrightarrow \sim q) \leftrightarrow (q \leftrightarrow r)$
 - (iii) $(p \rightarrow q) \wedge (\sim p \rightarrow r)$
- Q.2 (a)** Verify that $A(BC) = (AB)C$ for the following matrices **07**
- $A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 2 & 2 \\ 3 & 3 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 0 & -1 \\ 0 & -1 & 1 \\ -1 & 1 & 0 \end{bmatrix}$ $C = \begin{bmatrix} -1 & -1 \\ 2 & 2 \\ 1 & 1 \end{bmatrix}$
- (b)** Solve the following equations by using matrix inversion **07**
- $$\begin{aligned} 5x - y + z &= 4 \\ 3x + 2y - 5z &= 2 \\ x + 3y - 2z &= 5 \end{aligned}$$
- OR**
- (b)** Solve the following system of linear equations by Gauss elimination method. **07**
- $$\begin{aligned} 5x - y + z &= 10 \\ 2x + 4y &= 12 \\ x + y + 5z &= -1 \end{aligned}$$
- Q.3 (a)** Give a direct proof of “If n is an odd integer, then n^2 is odd.” **07**
- (b)** Using mathematical induction show that if n is a positive integer, then **07**
- $$1 + 2 + 2^2 + \dots + 2^n = 2^{n+1} - 1$$
- OR**
- Q.3 (a)** Prove that “if n is an integer and n^2 is odd, then n is odd” using proof by contraposition. **07**
- (b)** Answer the following questions. Justify your answer with proper explanation. **04**
- (i) How many cards must be selected from a standard deck of 52 cards to guarantee that at least three cards of the same suit are chosen?
 - (ii) How many cards must be selected to guarantee that at least three hearts are selected? **03**
- Q.4 (a)** Find the first six terms of the sequence defined by following recurrence relations and initial conditions **07**
- $$a_n = a_{n-1} - a_{n-2}$$

$$a_0 = 2$$
$$a_1 = -1$$

- (b) How many positive integers less than 1000 07
- (i) are divisible by 7?
 - (ii) are divisible by 7 but not by 11?
 - (iii) are divisible by both 7 and 11?
 - (iv) are divisible by either 7 or 11?
 - (v) are divisible by neither 7 nor 11?
 - (vi) have distinct digits?
 - (vii) have distinct digits and are even?
- OR**
- Q.4** (a) Let $a_n = 2^n + 5 \cdot 3^n$ for $n = 0, 1, 2, 3, \dots$
- (i) Find a_0, a_1, a_2, a_3 and a_4 05
 - (ii) Show that $a_2 = 5a_1 - 6a_0$ 02
- (b) How many positive integers between 1000 and 9999 inclusive 07
- (i) are divisible by 9?
 - (ii) are even?
 - (iii) have distinct digits?
 - (iv) are not divisible by 3?
 - (v) are divisible by 5 or 7?
 - (vi) are not divisible by either 5 or 7?
 - (vii) are divisible by 5 and 7?
- Q.5** (a) Find the equation of the circle passing through the points (5, -8), (-2, 9) and (2, 1) 07
- (b) Find the angle between the vectors $3i + j + 2k$ and $2i - 2j + 4k$ 07
- OR**
- Q.5** (a) Find the area of the triangle, the co-ordinates of whose vertices are (1, 3), (1,2), (-1,1) 07
- (b) Show that the points (8,-10), (7,-3) and (0, -4) are the vertices of a right triangle. 07
