Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA -INTEGRATED SEMESTER–I • EXAMINATION –SUMMER 2017

Subject Code: 4410604 **Date: 06-06-2017**

Subject Name: Basic Mathematics for IT

Time:10.30 am to 01.00 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: **07**

(i) Singleton set
(ii) Empty set
(iii) Power set
(iv) Union of two sets
(v) Complement set
(vi) Contradiction
(vii) Reflexive relation

(b) If A={1,4} B={4,5} C={5,7} **07**

Find (i) (A X B) U (A X C)
(ii) (A X B) $\cap$ (A X C)

Q.2 **(a)** Prove the following relation: $\sim(p \vee q) \equiv \sim p \wedge \sim q$ **07**

(b) Find the equation of a circle which passes through the points (1,3),(2,-1),(-1,1). **07**

OR

(b) Solve the following system of equation using Gauss Elimination method **07**

$$x + 2y + 3z = 14$$
$$3x + y + 2z = 11$$
$$2x + 3y + z = 11$$

Q.3 **(a)** **07**

Show that for a matrix $A = \begin{pmatrix} 1 & -1 & 1 \\ 2 & 3 & 0 \\ 18 & 2 & 10 \end{pmatrix}$, A(Adj A) = 0

(b) Using Predicate, Quantifier and rule of inference determine the given argument is valid or not **07**

"All student in the class understand logic. Xavier is a student in this class. Therefore, Xavier understand logic."

OR

Q.3 **(a)** **07**

Show that $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix} = 0$

(b) Construct the truth table for the following **07**

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

(ii) $(p \vee \neg q) \to q$

Q.4 **(a)** Define recurrence relation. Suppose that a person deposits $10,000 in a savings account at a bank yielding 11% per year with interest compounded annually. How much will be in the account after 30 year? **07**

(b) In a survey of 30 students, it was found that 19 take Mathematics, 17 take Music, 11 take History, 7 take Mathematics and History, 12 take Mathematics and Music, 5 take Music and History and 2 take all three courses. Find **07**

(i) The number of students that take Mathematics but do not take history

(ii) The number that take exactly two of the three courses.

OR

Q.4 **(a)** Suppose that the number of bacteria in a colony triples every hour. **07**

(i) Set up a recurrence relation for the number of bacteria after n hours have alapsed.

(ii) If 100 bacteria are used to begin a new colony , how many bacteria will be in the colony after 10 hours?

(b) Use mathematical Induction for the statement **07**

$P(n) = 1 + 2^1 + 2^2 + ... + 2^n = 2^{n+1} - 1$; for all non-negative integers n

(i) What is the statement P(1)?

(ii) Show that P(1) is true.

(iii) What is inductive hypothesis?

(iv) Prove inductive step.

Q.5 **(a)** Find the point which divides the join of (2,1) and (3,5) externally in the ratio 2:3 , the point lying towards the point (3,5). **07**

(b) (i)Define Vector and Scalar. **02**

(ii) Find the intercept that the line 3x-4y+12=0 make with the axis. What is the slope of the line? **05**

OR

Q.5 **(a)** Show that the points (8,-10), (7, -3) and (0, -4) are the vertices of a right triangle. **07**

(b) Show that the three points with position vectors given by **07**

a-2b+3c

-2a+3b+2c

-8a+13b are collinear.

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