

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

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 $A = \begin{pmatrix} 1 & -1 & 1 \\ 2 & 3 & 0 \\ 18 & 2 & 10 \end{pmatrix}$, $A(\text{Adj } A) = 0$

(b) Using Predicate, Quantifier and rule of inference determine the given argument 07

is valid or not
“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) $(p \rightarrow q) \leftrightarrow (\neg q \rightarrow \neg p)$
(ii) $(p \vee \neg q) \rightarrow q$
- 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 elapsed.
(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
 $P(n) = 1 + 2^1 + 2^2 + \dots + 2^n = 2^{n+1} - 1$; 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.
