

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA(Integrated) - SEMESTER-I • EXAMINATION – WINTER 2013

Subject Code: 4410604**Date: 24-12-2013****Subject Name: Basic Mathematics for IT****Time: 02:30 pm TO 05:00 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) (i) Define following: **03**
 (a) Finite set (b) Symmetric relation (c) Domain of a function

(ii) Find the radius and center of the circle: $2x^2 + 2y^2 - x + 3y + 1 = 0$ **04**

(b) (i) What are the elements of the power set of the set $\{1, \{2,3\}\}$? **03**

(ii) If $A = \{1,4\}, B = \{4,5\}, C = \{5,7\}$ **04**

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

Q.2 (a) Define Matrix. Verify that for the matrix $A = \begin{matrix} 1 & 2 & 3 \\ 1 & 3 & 4 \\ 1 & 4 & 3 \end{matrix}$ **07**

$$A(\text{Adj}A) = (\text{Adj}A)A = |A| I_3$$

(b) In South Delhi there are 20 colleges and 50 schools. Each school and college has 1 peon, 5 clerks, 1 cashier. Each college, in addition has 1 accountant and 1 head clerk. The monthly salary of each of them is as follows. Peon Rs.150, clerk Rs.250, cashier Rs.300, accountant Rs.350, head-clerk Rs.400 using matrix notation find **07**

(i) the total number of posts of each kind in schools and colleges taken together.

(ii) The total monthly salary bill of each school and college separately.

(iii) The total monthly salary bill of all the schools and colleges taken together.

OR

(b) Define Scalar Matrix. Solve the following equation by using matrix inversion. **07**
 $x + 2y - z = 3 \quad 3x - y + 2z = 1 \quad 2x - 2y + 3z = 2$

Q.3 (a) Define tautology. Show that each of this conditional statement is a tautology by using truth tables. **07**

(1) $(p \wedge q) \rightarrow p$

(2) $P \rightarrow (p \vee q)$

(3) $\neg p \rightarrow (p \rightarrow q)$

(4) $(p \wedge q) \rightarrow (p \rightarrow q)$

(5) $\neg (p \rightarrow q) \rightarrow p$

(b) Define bi-implication. Consider these statements. The first two are called premises and the third is called the conclusion. The entire set is called an argument. Express the statement using quantifier and logical connectives. **07**

“All lions are fierce.”

“Some lion do not drink coffee.”

“Some fierce creatures do not drink coffee.”

OR

Q.3 (a) Let p and q be the two propositions. **07**
 P : It is below freezing.
 Q : It is snowing.

Write these proposition using pp and q and logical connectives.

- (a) It is below freezing and snowing.
- (b) It is below freezing but not snowing.
- (c) It is not below freezing and it is not snowing.
- (d) It is either snowing or below freezing (or both).
- (e) If it is below freezing, it is also snowing.
- (f) It is either below freezing or it is snowing, but it is not snowing if it is below freezing.
- (g) That it is below freezing is necessary and sufficient for it to be snowing.

- (b) (i) Express the statement “If a person is female and is a parent, then this person is Someone’s mother” as a logical expression involving predicates, quantifiers with a domain consisting of all people and logical connectives. **04**

(ii) Prove that if n is integer and $3n + 2$ is odd, then n is odd. **03**

- Q.4** (a) What do you mean by basis step and inductive step? Let P(n) be the statement that $1^2 + 2^2 + \dots + n^2 = n(n+1)(2n+1)/6$ for the positive integer n. **07**

- (a) What is the statement P (1) ?
- (b) Show that P(1) is true, completing the basis step of the proof.
- (c) What is inductive hypothesis?
- (d) What do you do need to prove in the inductive step?
- (e) Complete the inductive step.

- (b) Suppose that “I Love New Jersey” T-Shirts come in five different sizes: S, M, L, XL and XXL. Further suppose that each size comes in four color, white, red, green and black, except for XL, which comes only in red, green and black and XXL, which comes only in green and black. How many different shirt does a souvenir shop have to stock to have at least one of each available size and color of the T-shirt? **07**

OR

- Q.4** (a) (i) Explain Product rule and Sum rule. **04**

(ii) How many different three-letter initials can people have? **03**

- (b) 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**

- Q.5** (a) (i) Find the point which divides the join of (2,1) and (3,5) externally in the ratio **04**

2:3, the point lying towards the point(3,5).

(ii) Find the locus of a point which is equidistant from the points (1,2) and (3,5). **03**

- (b) Find the intercepts that the line $3x - 2y - 6 = 0$ makes on the axes. What is slope of line? **07**

OR

- Q.5** (a) (i) Show that the points (2,6), (5,1), (0,-2) and (-3,3) are the vertices of a square. **07**

- (b) (i) Find the equation of line joining the center of the two circles. **04**

$$X^2 + y^2 - 2x + 4y - 1 = 0$$

$$X^2 + y^2 + 2x - 4y + 1 = 0$$

- (ii) What is the difference between vector and scalar? **03**
