

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA Integrated - SEMESTER-I• EXAMINATION – WINTER • 2014

Subject Code: 4410604**Date: 31-12-2014****Subject Name: Basic Mathematics for IT****Time: 10:30 am - 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) (i) Define following: 07**
 (a) Power Set
 (b) Symmetric relation
 (c) Domain of a function
 (d) Scalar matrix
 (e) Unit Vector
 (f) Finite set
 (g) Transitive relation
- (b) (i) What is the difference between vector and scalar? 03**
(ii) What is Function? Explain types of functions with examples. 04
- Q.2 (a) Define Matrix. Find rank of. matrix 07**

$$A = \begin{pmatrix} 1 & -3 & 2 \\ -3 & 9 & -6 \\ 2 & -6 & 4 \end{pmatrix}$$
- (b) In South Delhi there are 20 colleges and 50 schools. Each school and college has 07**
 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
 (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**

$$\begin{aligned} x + 2y - z &= 3 \\ 3x - y + 2z &= 1 \\ 2x - 2y + 3z &= 2 \end{aligned}$$
- Q.3 (a) Define tautology. Construct a truth table for each of these compound 07**
 propositions.
 (1) $p \vee \neg q$
 (2) $(p \rightarrow q) \leftrightarrow (\neg q \rightarrow \neg p)$
 (3) $\neg p \rightarrow (p \rightarrow q)$
 (4) $(q \wedge (p \rightarrow q)) \rightarrow q$
 (5) $(p \vee q) \rightarrow (p \wedge q)$
 (6) $\neg (p \rightarrow q) \rightarrow p$
- (b) Define bi-implication and existential quantifier. Express the statement “Every 07**
 computer science student needs to take Java Programming.”

OR

- Q.3 (a)** Express the following using predicates, quantifiers and logical Connectives. Also Verify the validity of the consequences. **07**
 Everyone who graduates gets a job.
 Ram is graduated.
 Therefore, Ram got a job.
- (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) Translate the statement “You can access the Internet from campus only if you are a computer science major or you are not a freshman.” **03**
- Q.4 (a)** What do you mean by basis step and inductive step? Let $P(n)$ be the statement that $1^3 + 2^3 + \dots + n^3 = (n(n+1)/2)^2$ 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 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) How many different bit strings of length seven are there? **04**
 (ii) How many different three-letter initials can people have? **03**
- (b)** A computer company receives 350 applications from computer graduates for a job planning a line of new web servers. Suppose that 220 of these people majored in computer science, 147 majored in business, and 51 majored both in computer science and in business. How many of these applicants major neither in computer science nor in business **07**
- Q.5 (a)** Show that medians of a triangle are concurrent **07**
(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) Find the distance between the points (4,-7) and (-1,5). **03**
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