Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA Integrated - SEMESTER–I • EXAMINATION – SUMMER • 2014

Subject Code: 4410604 **Date: 25-06-2014**

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)** Define following: **07**

(a)Tautology
(b)Symmetric relation
(c)Scalar matrix
(d)Unit Vector
(e)Conjunction
(f)Power Set
(g)Transitive relation

(b) (i) What is the difference between vector and scalar? **03**

(ii)Give the verbal translation of the following sets: **04**

(a){ 2,4,6,8}
(b) {1, 3, 5, 7, 9…….}
(c) {-1,1}

Q.2 **(a)** Define Matrix. Find adjoint and then inverse of matrix **07**

$$A = \begin{matrix} 1 & -2 & 3 \\ -2 & -1 & 0 \\ 4 & -2 & 5 \end{matrix}$$

(b) A publishing house has two branches. In each branch, there are three offices. In each office, there are 3 peons, 4 clerks and 5 typists. In one office of a branch, 6 salesmen are also working. In each office of other branch 2 head-clerks are also working. Using matrix notation find **07**

(i) the total number of posts of each kind in all offices taken together in each branch

(ii) the total number of posts of each kind in all office taken together from the both branches.

OR

(b) Find rank of. matrix **07**

$$A = \begin{matrix} 1 & -3 & 2 \\ -3 & 9 & -6 \\ 2 & -6 & 4 \end{matrix}$$

Q.3 **(a)** Construct a truth table for each of these compound propositions. **07**

(1) $P \wedge \neg p$
(2) $P \vee p\neg$
(3) $(p \vee \neg q) \rightarrow q$
(4) $(pVq) \rightarrow (p\wedge q)$
(5) $(p\rightarrow q) \leftrightarrow (\neg q \rightarrow \neg p)$
(6) $(p\rightarrow q)\rightarrow (q\rightarrow p)$
(7) $P \wedge (pV q)$

(b) Define existential quantifier. Express the statement "Every student in this class Has studied calculus" using predicates and quantifiers. **07**

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) State which rules of inference is the basis of the following argument:"It is below freezing now.Therefor,it is either below freezing or raining now." **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 $1^3 + 2^3 + \ldots + n^3 = (n(n+1)/2)^2$ 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 do need to prove in the inductive step?
(e)Complete the inductive step.

(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**

OR

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

(ii)How many different bit strings of length seven are there? **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 distance between the points (4,-7) and (-1,5). **04**

(ii)Find the intercepts that the line $3x-4y+12 = 0$ make on the axes. What is slope of line? **03**

(b) Show that medians of a triangle are concurrent. **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 radius and center of the circle **04**

$2x^2 + 2y^2 - x + 3y + 1 = 0$

(ii) Define zero vector and Localized vector. **03**

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