Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

## MCA Integrated– SEMESTER –I EXAMINATION –SUMMER-2019

**Subject Code: 4410604** **Date: 03-06-2019**

**Subject Name: Basic Mathematics for IT**

**Time:10.30 am to 1.00 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 the following terms: **07**

1) Power set
2) Scalar Matrix
3) Tautology
4) Symmetric Matrix
5) Unit Vector
6) Conjunction
7) Domain of the function

**(b)** (i) Give the verbal translation of the following sets: **07**

(a){ 2,4,6,8,10}

(b) {2, 4, 6, 8, 10…….}

(c) {-1,1}

(ii) Explain the difference between Scalar and Vector.

**Q.2** **(a)** Find inverse of the following matrix. **07**

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

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

(i) $((p \rightarrow q) \wedge (q \rightarrow r)) \rightarrow (p \rightarrow r)$

(ii) $(p \rightarrow (q \wedge r)) \vee (\sim p)$

**OR**

**(b)** Solve the following equation by using matrix inversion. **07**

x + 2y -z = 3

3x - y + 2z =1

2x - 2y +3z =2

**Q.3** **(a)** 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."

**(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**

**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)** 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.

**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)** 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)** (i) Find the distance between the points (4,-7) and (-1,5). **07**
(ii)Find the intercepts that the line 3x-4y+12 = 0 make on the axes. What is slope of line?

**Q.5** **(a)** 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. **07**
$2x^2 + 2y^2 – x + 3y + 1 = 0$
(ii) Find the distance between the points (4,-7) and (-1,5).

**OR**

**Q.5** **(a)** (i) Find the intercepts that the line 3x -2y -6 =0 makes on the axes. What is slope of line? **07**
(ii) Find the equation of the circle which passes through the points (1,3), (2, -1) and (-1,1).

**(b)** Let $a_n = 2^n + 5 \cdot 3^n$ for n = 0, 1, 2, 3,… **07**
(i) Find $a_0$, $a_1$, $a_2$, $a_3$ and $a_4$
(ii) Show that $a_2 = 5a_1 - 6a_0$

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