



Bachelor Level / First Year/ First Semester/ Science  
**Computer Science and Information Technology (CSc. 109)**  
(Introduction to Information Technology)  
**(NEW COURSE)**

Full Marks: 60  
Pass Marks: 24  
Time: 3 hours.

*Candidates are required to give their answers in their own words as far as practicable.*  
The figures in the margin indicate full marks.

### Section A

Attempt any Two questions:

(2×10 = 20)

1. Differentiate analog computer with digital computer. What is CPU and how it works? What does an instruction cycle in CPU consists of? (3+4+3)
2. What is computer network? Discuss different types of data transmission media in computer network with their advantages and disadvantages. (2+8)
3. What is database management system? Why database management systems are used. Discuss the database system architecture. (3+2+5)

### Section B

Attempt any Eight questions:

(8×5 = 40)

4. What is cache memory? How it is different from register? (3+2)
5. Discuss about the source data entry device with example. (5)
6. How binary addition is done? Show binary addition of (11001) with (11011). (5)
7. What is software? How it differs from hardware? Why software is needed? (2+2+1)
8. Describe the functionalities of operating system. (5)
9. What is internet? Describe about the internet architecture. (1+4)
10. Define multimedia. Discuss the applications of multimedia. (2+3)
11. Differentiate security attack from security threat. How virus affects computer? (3+2)
12. Write short notes on: (2.5+2.5)
  - a. GIS
  - b. E-commerce



Bachelor Level / First Year/ First Semester/ Science  
Computer Science and Information Technology (PHY. 113)  
(Physics )  
**(NEW COURSE)**

Full Marks: 60  
Pass Marks: 24  
Time: 3 hours.

*Candidates are required to give their answers in their own words as far as practicable.  
The questions are of equal value.*

**Section A**

**Long Answer Questions:**

(2x10=20)

Attempt any TWO questions

1. Discuss electrical conductivity of semiconductors. Derive expression for conductivity in terms of impurity ionization energy. Give a plot to discuss 'Theoretical temperature dependence of the electrical conductivity of an impurity semiconductor'. (10)
2. Describe processes involved in the fabrication of integrated circuits include epitaxial growth, oxidation, oxide removal and pattern definition, doping (impurities in the Si), and interconnection of components. (10)
3. Find expression for force on a current-carrying wire in a magnetic field to find the force experienced by a single charge. (10)

**Section B**

**Short Answer Questions:**

(8x5=40)

Attempt any EIGHT questions:

4. Give spectrum of Hydrogen atom and discuss its lines. (5)
5. Give a brief account of Kronig-Penny model. (5)
6. Describe the term 'space quantization'. (5)
7. A given spring stretches 0.1 m when a force of 20 N pulls on it. A 2-kg block attached to it on a frictionless surface is pulled to the right 0.2 m and released. (a) What is the frequency of oscillation of the block? (b) What are the velocity and acceleration when  $x = 0.12$  m, on the block's first passing this point? (5)
8. A proton is moving with a velocity  $\mathbf{v} = (3 \times 10^5 \mathbf{i} + 7 \times 10^5 \mathbf{k})$  m/sec in a region where there is a magnetic field  $\mathbf{B} = 0.4 \mathbf{j}$  T. Find the force experienced by the proton. (5)

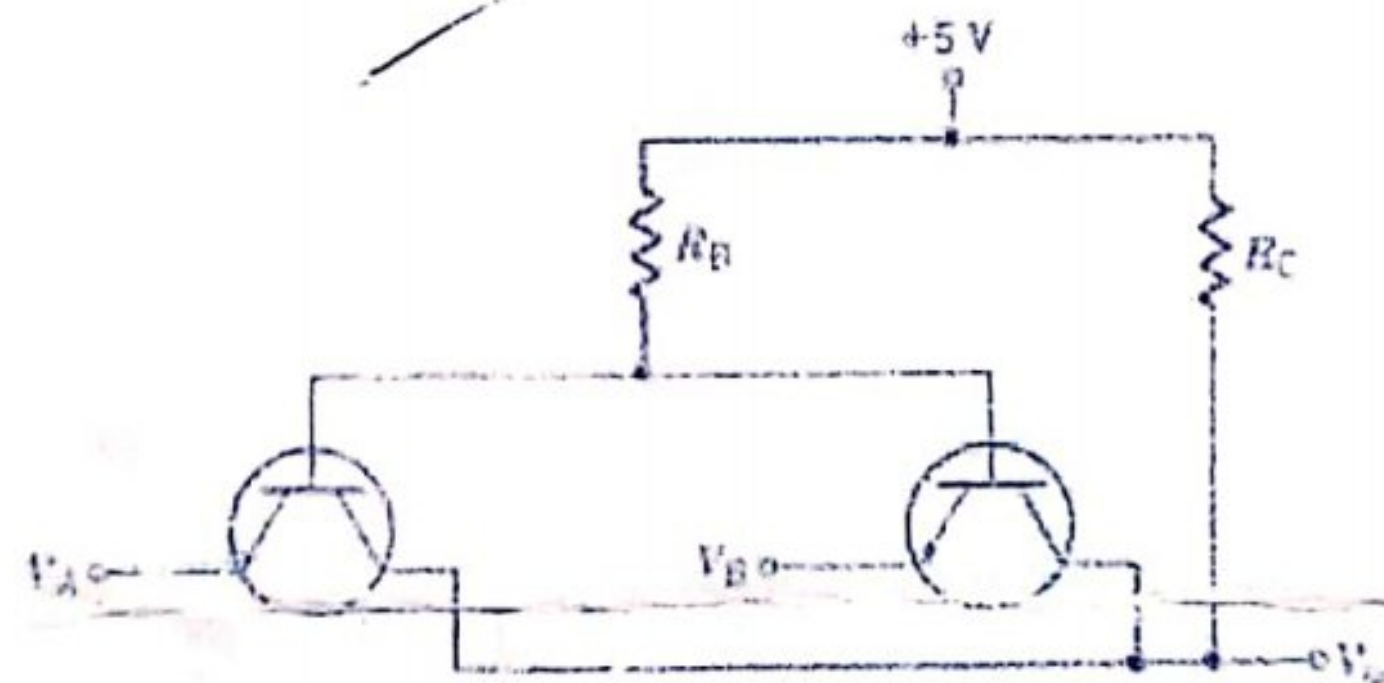


9. In neutron spectroscopy a beam of mono-energetic neutrons is obtained by reflecting reactor neutrons from a beryllium crystal. If the separation between the atomic planes of the beryllium crystal is  $0.732 \text{ \AA}$ , what is the angle between the incident neutron beam and the atomic planes that will yield a monochromatic beam of neutrons of wavelength  $0.1 \text{ \AA}$ ? (5)

10. (a) How many atomic states are there in hydrogen with  $n = 3$ ? (b) How are they distributed among the sub shells? Label each state with the appropriate set of quantum numbers  $n, l, m_l, m_s$ . (c) Show that the number of states in a shell, that is, states having the same  $n$ , is given by  $2n^2$ . (Hint:  $1 + 2 + 3 + \dots + n = n(n+1)/2$ ). (5)

11. The density of aluminum is  $2.70 \text{ g/cm}^3$  and its molecular weight is  $26.98 \text{ g/mole}$ . (a) Calculate the Fermi energy. (b) If the experimental value of  $E_F$  is  $12 \text{ eV}$ , what is the electron effective mass in aluminum? [Aluminum is trivalent]. (5)

12. Analyze the circuit shown in the figure below. Determine the logic function performed by the circuit by making and justifying the appropriate truth table. (5)





# GUPTA TUTORIAL

BScCSIT Level/First Semester  
Mathematics[MTH 112]  
Calculus

Full Marks: 80  
Pass Marks: 32  
Time 3 Hrs.

Candidates are required to give their answers in their own words as far as practicable.

Group A (10 × 3 = 30)

Attempt any THREE questions.

1. (a) If  $f(x) = \sqrt{x}$  and  $g(x) = \sqrt{3-x}$  then find  $f \circ g$  and its domain and range. [5]  
(b) A rectangular storage container with an open top has a volume of  $20m^3$ . The length of its base is twice its width. Material for the base costs Rs10 per square meter; material for the sides costs Rs4 per square meter. Express the cost of materials as a function of the width of the base. [5]

2. (a) Using rectangles, estimate the area under the parabola  $y = x^2$  from 0 to 1. [5]  
(b) A particle moves along a line so that its velocity  $v$  at time  $t$  is [5]

$$v = t^2 - t + 6$$

- (i) Find the displacement of the particle during the time period  $1 \leq t \leq 4$ .  
(ii) Find the distance traveled during this time period.

3. (a) Find the area of the region bounded by  $y = x^2$  and  $y = 2x - x^2$ . [5]  
(b) Using trapezoidal rule, approximate  $\int_1^2 1/x dx$  with  $n = 5$ . [5]

4. (a) Solve:  $y' = x^2/y^2, y(0) = 2$ . [5]  
(b) Solve the initial value problem:  $y'' + y' - 6y = 0, y(0) = 1, y'(0) = 0$ . [5]

Group B (10 × 5 = 50)

Attempt any TEN questions.

5. Recent studies indicate that the average surface temperature of the earth has been rising steadily. Some scientists have modeled the temperature by the linear function  $T = 0.03t + 8.50$ , where  $T$  is temperature in degree centigrade and  $t$  represents years since 1900. (a) What do the slope and  $T$ -intercept represent? (b) Use the equation to predict the average global surface temperature in 2100.



6. Find the equation of tangent at  $(1, 2)$  to the curve  $y = 2x^2$ .
7. State Rolle's theorem and verify the Rolle's theorem for  $f(x) = x^2 - 3x + 2$  in  $[0, 3]$ .
8. Use Newton's method to find  $\sqrt[5]{2}$  correct to five decimal places.
9. Find the derivative of  $\mathbf{r}(t) = (1 - t^2)\mathbf{i} - te^{-t}\mathbf{j} + \sin 2t\mathbf{k}$  and find the unit tangent vector at  $t = 0$ .
10. Find the volume of the solid obtained by rotating about the y-axis the region between  $y = x$  and  $y = x^2$ .
11. Solve:  $y' + 2xy - 1 = 0$
12. What is a sequence? Is the sequence  

$$a_n = \frac{n}{\sqrt{5+n}}$$
convergent? 40
13. Find a vector perpendicular to the plane that passes through the points:  $P(1, 4, 6)$ ,  $Q(-2, 5, -1)$  and  $R(1, 1, -1)$
14. Find the partial derivatives of  $f(x, y) = x^2 + 2x^3y^2 - 3y^2 + x + y$ , at  $(1, 2)$ .
15. Find the local maximum and minimum values, saddle points of  $f(x, y) = x^4 + y^4 - 4xy + 1$ .

GUPTA TUTORIAL



# GUPTA TUTORIAL ☆

Bachelor Level / First Year/ First Semester/ Science  
Computer Science and Information Technology (CSc. 111)  
(Digital Logic)  
**(NEW COURSE)**

Full Marks: 60  
Pass Marks: 24  
Time: 3 hours.

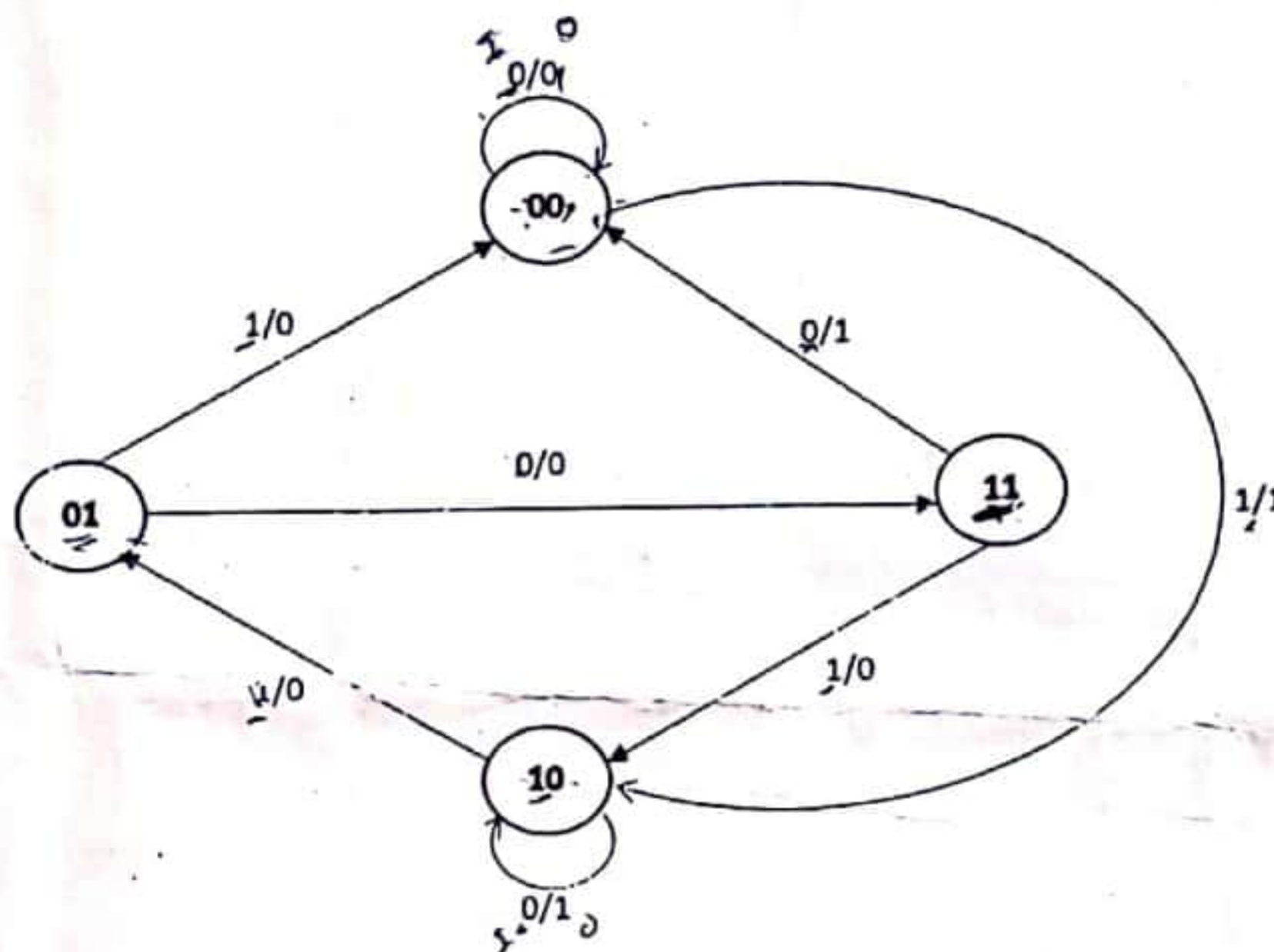
Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

## Section A

(2×10=20)

Attempt any Two questions:

- Design the sequential circuit with respect to the following state diagram using J-K flip flops.



- Implement  $F = \sum (0, 2, 3, 4, 7)$  using

- Multiplexer
- Decoder
- PLA

- Differentiate between synchronous and asynchronous counter. Design mod-7 synchronous counter using T-flip flop. Show necessary truth tables and k-maps.

## Section B

(8×5=40)

Attempt any Eight questions

- Provide one example where shift right operation can be used. Explain parallel-in-parallel-out register.



5. Carry out the following tasks

- Perform 1's complement subtraction of  $110101-100101$
- Represent decimal number 0.125 into its binary form

6. Derive the Boolean expression for sum and carry of half adder. Draw its combinational circuit. Implement it using only NAND gates.

7. Express the Boolean function  $F = x + yz$  as a product of max-terms.

8. Minimize the following Boolean function using K-map

$$F(A, B, C, D) = \sum m(0, 1, 3, 5, 7, 8, 9, 11, 13, 15)$$

$(3 \times 7) \times 4$

9. What are the practical implications of up counter? Explain Binary ripple counter.

10. Design a combinational circuit with three inputs and one output. The output is 1 when the binary value of the inputs is an odd number. (C)

11. Differentiate between PLA and PAL. Explain 4-bit magnitude comparator.

12. Write short notes on (Any two)

- Negative Logic
- CMOS
- EBCDIC

GUPTA TUTORIAL

$$AB' + A'B$$

$$AB(A+A')$$

$$AB$$



Bachelor Level / First Year/ First Semester/ Science  
Computer Science and Information Technology (CSc. 110)  
(C Programming)  
**(NEW COURSE)**

Full Marks: 60  
Pass Marks: 24  
Time: 3 hours.

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

**Section A****Attempt any two questions:**

(2×10=20)

1. What do you mean by jump statement? Explain each jump statement with example. Write a program to check whether a number entered is prime or not. (1+5+4)
2. Explain any three string functions. Write a program to check if two matrices are identical or not. (3+7)
3. Define structure. Explain nested structure with example. Create a structure named **book** with **name**, **author**, and **publisher** as its members. Write a program using this structure to read data of 50 books and display name of those books published by "XYZ" publisher. (1+2+7)

**Section B****Attempt any eight questions:**

(8×5=40)

4. Explain structure of a C program with suitable example. (5)
5. What is variable? How is it different from constant? How do you write comments in C? (1+2+2)
6. Explain formatted I/O functions in detail. • *printf(), scanf()* (5)
7. Write a program using your own function to find sum of two numbers. (5)
8. Write a program to print largest among three numbers entered by the user. (5)
9. Explain dynamic memory allocation with example. (5)
10. Write a program that simply reads data from a file. (5)
11. Write a program to draw a line using graphics function. (5)
12. Write short notes on: (2 × 2.5 = 5)
  - a. History of C
  - b. Bitwise operator