

Tribhuvan University  
Institute of Science and Technology  
2077



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. Define computer software. Differentiate system software with application software. Explain different types system software in detail. (1 + 2 + 7)
2. What are the benefits of using computer network? Explain different types of computer network in detail. What is network topology? (3 + 6 + 1)
3. What is database? What are the benefits of storing data in databases? Explain database system architectures in detail. (1 + 3 + 6)

**Section B**

**Attempt any eight questions.**

**(8 × 5 = 40)**

4. What are different characteristics of a computer? Differentiate digital computer with analog computer. (3 + 2)
5. What is primary memory? Compare primary memory with secondary memory. (2 + 3)
6. Define memory hierarchy. Explain different types of ROM in detail. (1 + 4)
7. Explain any two input devices in detail. (5)
8. Convert  $(110101.101)_2$  to decimal. (5)
9. Define IP address. Why do we need this address? Compare IPv4 address with IPv6 address. (1+ 2+2)
10. What are different elements of multimedia? Explain. (5)
11. What is cryptography? How does cryptography provide security to our data? (2 + 3)
12. Write short notes on: ( $2 \times 2.5 = 5$ )
  - a. Central processing unit
  - b. IoT

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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)

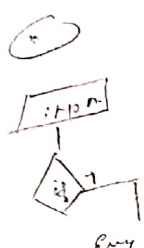
1. What do you mean by looping? Explain while loop with suitable example. Compare while loop with do-while loop. Write a program to find sum and average of first n natural numbers. (1+3+2+4)
2. What are the benefits of using arrays? Compare one dimensional array with two dimensional array. Write a program to find transpose of a matrix. (2 +2+6)
3. What is structure? How is it different from union? Create a structure named **course** with **name**, **code**, and **credit\_hour** as its members. Write a program using this structure to read data of 5 courses and display data of those courses with **credit\_hour** greater than 3. (1+2+7)

Section B

Attempt any eight questions:

(8×5=40)

4. Explain flowchart with example. What are the benefits of using flowcharts? (3 + 2)
5. What is data type? Why do we need it in programming? Explain any three basic data types with example. (1 + 1 + 3)
6. What do you mean by unformatted I/O? Explain. (5)
7. Write a program to display first n prime numbers. (5)
8. Write a program to find product of two integers using your own function. (5)
9. Define pointer. How to you return pointers from functions? Explain with example. (1 + 4)
10. Explain different file I/O functions with example. (5)
11. Write a program to draw a circle using graphics function. (5)
12. Write short notes on: (2 × 2.5 = 5)
  - a. Compilation and execution
  - b. Operator precedence and associativity





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

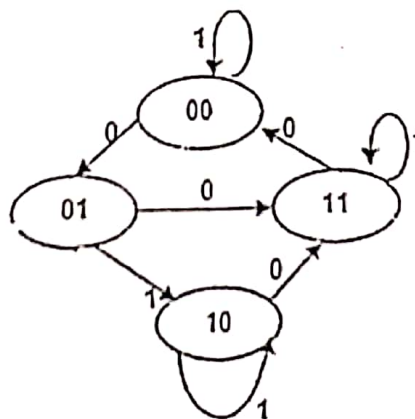
Full Marks: 60  
Pass Marks: 24  
Time: 3 hours.

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

Attempt any two questions:

(2×10=20)

1. Design a combinatorial circuit that generates 9's complement of a BCD number. (10)
2. Implement the following functions using PLA (10)
  - $w(A, B, C, D) = \sum(2, 12, 13)$
  - $x(A, B, C, D) = \sum(7, 8, 9, 10, 11, 12, 13, 14, 15)$
  - $y(A, B, C, D) = \sum(0, 2, 3, 4, 5, 6, 7, 8, 10, 11, 15)$
  - $z(A, B, C, D) = \sum(1, 7, 8, 12, 13)$
3. Design sequential circuit specified by the following state diagram using T flip-flops. (10)



- Answered 8
4. List two major characteristics of digital computer. Represent -6 (negative six) using 8 bits in signed magnitude, signed-1's-complement and signed-2's-complement respectively. Represent decimal number 4673 in a) octal, and b) BCD. (1+2+2)
  5. Where is CMOS suitable to use? Define Power dissipation. Show that the positive logic NAND gate is a negative logic NOR gate and vice versa. (1+1+3)
  6. Simplify the following function and implement them with two level NOR gate circuit,  $F(w, x, y, z) = wx' + y'z' + w'yz'$  (5)

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7. Design a full subtractor circuit with three inputs  $x$ ,  $y$ ,  $B_{in}$  and two outputs Diff and  $B_{out}$ . The circuit subtracts  $x-y-B_{in}$  where  $B_{in}$  is the input borrow,  $B_{out}$  is the output borrow, and Diff is the difference. (5)
8. Design 4-bit even parity generator. (5)
9. What is the difference between a serial and parallel transfer? Explain how to convert serial data to parallel and parallel data to serial. What type of register is needed? (1+3+1)
10. Explain negative-edge triggered D flip flop with necessary logic diagram and truth table. (5)
11. Illustrate the use of Binary ripple counter and BCD ripple counter. (2.5+2.5)
12. Write Short notes on (Any two) (2x2.5)
  - a) RTL
  - b) State Reduction
  - c) POS

$$wxy + w\bar{x}\bar{y} \quad w\bar{y}\bar{z} + w\bar{x}\bar{y}\bar{z} + w\bar{x}\bar{y}z + w\bar{x}y\bar{z}$$

$$w\bar{x}\bar{y} + w\bar{x}\bar{y} (2+2) + w\bar{x}\bar{y}\bar{z} (2+2) + w\bar{x}\bar{y}z (2+2)$$

$$w\bar{x}\bar{y}\bar{z} + w\bar{x}\bar{y}z + w\bar{x}y\bar{z} + w\bar{x}yz$$

$$w\bar{x}\bar{y}\bar{z} + w\bar{x}\bar{y}z + w\bar{x}y\bar{z} + w\bar{x}yz$$

$$w\bar{x}\bar{y}\bar{z} + w\bar{x}\bar{y}z + w\bar{x}y\bar{z} + w\bar{x}yz$$

$$10xy + 10\bar{x}\bar{y}$$



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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** ( $10 \times 3 = 30$ )

Attempt any **THREE** questions.

1. (a) If  $f(x) = x^2$  then find  $\frac{f(2+h)-f(2)}{h}$ . [2]  
 (b) (a) Dry air is moving upward. If the ground temperature is  $20^\circ$  and the temperature at a height of  $1\text{km}$  is  $10^\circ\text{C}$ , express the temperature  $T$  in  $^\circ\text{C}$  as a function of the height  $h$  (in kilometers), assuming that a linear model is appropriate. (b) Draw the graph of the function in part (a). What does the slope represent? (c) What is the temperature at a height of  $2\text{km}$ ? [5]  
 (c) Find the equation of the tangent to the parabola  $y = x^2 + x + 1$  at  $(0, 1)$ . [3]
2. (a) A farmer has  $2000\text{ft}$  of fencing and wants to fence off a rectangular field that borders a straight river. He needs no fence along the river. What are the dimensions of the field that has the largest area? [5]  
 (b) Sketch the curve [3]

$$y = \frac{1}{x-3}$$

3. (a) Show that the  $\int_1^\infty \frac{1}{x^2}$  converges and  $\int_1^\infty \frac{1}{x}$  diverges. [2]

(b) If  $f(x, y) = xy/(x^2 + y^2)$ , does  $f(x, y)$  exist, as  $(x, y) \rightarrow (0, 0)$ ? [3]

(c) A particle moves in a straight line and has acceleration given by  $a(t) = 6t^2 + 1$ . Its initial velocity is  $4m/sec$  and its initial displacement is  $s(0) = 5cm$ . Find its position function  $s(t)$ . [5]

4. (a) Evaluate [5]

$$\int_{-3}^2 \int_0^{\pi/2} (y + y^2 \cos x) dx dy$$

(b) Find the Maclaurin's series for  $\cos x$  and prove that it represents  $\cos x$  for all  $x$ . [5]

### Group B ( $10 \times 5 = 50$ )

Attempt any TEN questions.

5. If  $f(x) = x^2 - 1$ ,  $g(x) = 2x + 1$ , find  $f \circ g$  and  $g \circ f$  and domain of  $f \circ g$ .

6. Define continuity of a function at a point  $x = a$ . Show that the function  $f(x) = \sqrt{1 - x^2}$  is continuous on the interval  $[-1, 1]$ .

7. State Rolle's theorem and verify the Rolle's theorem for  $f(x) = x^3 - x^2 - 6x + 2$  in  $[0, 3]$ .

8. Find the third approximation  $x_3$  to the root of the equation  $f(x) = x^3 - 2x - 7$ , setting  $x_1 = 2$ .

9. Find the derivative of  $r(t) = (1 + t^2)\mathbf{i} - te^{-t}\mathbf{j} + \sin 2t\mathbf{k}$  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:  $y'' + y' = 0$ ,  $y(0) = 5$ ,  $y(\pi/4) = 3$

12. Show that the series  $\sum_{n=0}^{\infty} \frac{1}{1+n^2}$  converges.

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 derivative of  $f(x, y) = x^3 + 2x^2y^3 - 3y^2 + x + y$ , at  $(2, 1)$ .

15. Find the local maximum and minimum values, saddle points of  $f(x, y) = x^4 + y^4 - 4xy + 1$ .

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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.

Group A

Long Answer Questions:

Attempt any TWO questions

(2x10=20)

1. Explain RTL and TTL gates. How memory and clock circuits can be made by using these gates? Explain how they work?
2. Set up differential equation for an oscillation of a spring using Hooke's and Newton's second law. Find the general solution of this equation and hence the expressions for period, velocity and acceleration of oscillation.
3. Describe Frank-Hertz experiment. Interpret how the results of this experiment advocate atomic model proposed by Bohr?

Group B

Short Answer Questions:

Attempt any EIGHT questions:

(8x5=40)

4. Discuss magnetic dipole moment. What is its effect on atom? and on molecules? Explain.
5. Describe the following process of IC production: (a) Oxidation, (b) Pattern definition, and (c) Doping.
6. Explain the construction and working of bipolar junction transistor (BJT).
7. A roulette wheel with moment of inertia  $I = 0.5 \text{ kg m}^2$  rotating initially at 2 rev/sec coasts to a stop from the constant friction torque of the bearing. If the torque is 0.4 Nm, how long does it take to stop?
8. Two large parallel plates are separated by a distance of 5 cm. The plates have equal but opposite charges that create an electric field in the region between the plates. An  $\alpha$  particle ( $q=3.2 \times 10^{-19} \text{ C}$ ,  $m= 6.68 \times 10^{-27} \text{ kg}$ ) is released from the positively charged plate, and it strikes

the negatively charged plate  $2 \times 10^{-6}$  sec. later. Assuming that the electric field between the plates is uniform and perpendicular to the plates, what is the strength of the electric field?

9. In neutron spectroscopy a beam of monoenergetic 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  $0.1 \text{ \AA}$ ?

10. What is the probability of finding a particle in a well of width  $a$  at a position  $a/4$  from the wall if

$n = 1$ , if  $n = 2$ , if  $n = 3$ . Use the normalized wavefunction  $\psi(x, t) = \left(\frac{2}{a}\right)^{1/2} \sin\left(\frac{n\pi x}{a}\right) e^{-\frac{iEt}{\hbar}}$ .

11. The energy gap in silicon is  $1.1 \text{ eV}$ , whereas in diamond it is  $6 \text{ eV}$ . What conclusion can you draw about the transparency of the two materials to visible light ( $4000 \text{ \AA}$  to  $7000 \text{ \AA}$ )?

12. Find the truth table for the circuit shown in the figure. What logic function will the circuit perform if the constant  $+5 \text{ V}$  input to the first two gates is changed to ground potential?

