CSc.109-2077 ✡

Tribhuvan University
Institute of Science and Technology
2077
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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 for 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 × 2.5 = 5)

a. Central processing unit
b. IoT

CSc.111-2077 ✡

Tribhuvan University
Institute of Science and Technology
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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.

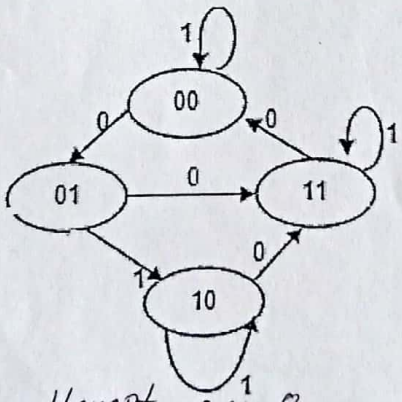
Candidates are required to give their answers in their own words as for as practicable.
The figures in the margin indicate full marks.

Attempt any two questions: Group A (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) = ∑(2,12,13)
   x (A, B, C, D)= ∑ (7,8,9,10,11,12,13,14,15)
   y (A, B, C, D) = ∑ (0,2,3,4,5,6,7,8,10,11,15)
   z (A, B, C, D) = ∑ (1,2,8,12,13)

3. Design sequential circuit specified by the following state diagram using T flip-flops. (10)



Group B attempt any 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)

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

CSc. 110-2077 ✡

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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 for 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 5courses and display data of those curses 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

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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^o and the temperature at a height of $1km$ is 10^oC, express the temperature T in ^oC 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 $2km$? [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 $2000ft$ 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 [5]

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

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 $(x,y) \to (0,0)$? [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]

$$\int_{-3}^{2}\int_{0}^{\pi/2}(y + y^2\cos x)dxdy$$

(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 fog and gof and domain of fog.
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 $\mathbf{r}(t) = (1+t^2)\mathbf{i} - te^{-t}\mathbf{j} + \sin 2t\mathbf{k}$ 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: $y'' + y' = 0, y(0) = 5, y(\pi/4) = 3$
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 $f(x,y) = x^4 + y^4 - 4xy + 1$.

PHY 113-2077 ✡

Tribhuvan University
Institute of Science and Technology
2077
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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 for 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: **(8x5=40)**
Attempt any EIGHT questions:

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 equaled but opposite charges that create an electric field in the region between the plates. An α particle ($q=3.2 \times 10^{-19}$ C, $m= 6.68 \times 10^{-27}$ kg) is released from the positively charged plate, and it strikes

the negatively charged plate 2×10^{-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 $\mathring{A}$, what is the angle between the incident neuton beam and the atomic planes that will yield a monochromatic beam of neutrons of wavelength 0.1 $\mathring{A}$?

10. What is the probability of finding a particle in a well of width α at a position $\alpha/4$ from the wall if $n = 1$, if $n = 2$, if $n = 3$. Use the normalized wavefunction $\psi(x,t) = \left(\frac{2}{a}\right)^{\frac{1}{2}} \sin\left(\frac{n\pi x}{a}\right) e^{\frac{iEt}{\hbar}}$.

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

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