

# Lumbini ICT Campus

Gaindakot, Nawalparasi

## Qualifying Test 2075

Bachelor Level/ First Year/ First Semester/ Science

**Computer Science and Information Technology (CSC 109)**

**(Introduction to Information Technology) SET A**

Full Marks: 60

Pass Marks: 24

Time: 3 hours

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

### Long Questions (ANY TWO)

[2 \* 10 = 20]

1. Why do we need computer network? Discuss different types of network topologies along with their merits and demerits. [3 + 7]
2. What are the benefits of storing data using databases? Discuss centralized and client-server architecture of database system. [3 + 7]
3. Write the different ways of software acquisition. Discuss any three functions of OS in detail. What is deadlock? (2+6+1)

### Short Questions (ANY EIGHT)

[8 \* 5 = 40]

4. What do you mean by computer hardware and software? Differentiate between system software and application software. [2+3]
5. Discuss the sequential access & direct access of storage devices. [2.5+2.5]
6. Convert (AF7) to binary. Subtract (1001101) from (1100011) . (2 + 3)
7. Explain in detail the working of I/O System. [5]
8. What are network devices? Explain any two network devices. [5]
9. Define IP address. Differentiate between IPv4 & IPv6. [1 +4]
10. Define cryptography. Discuss public key cryptography in detail. [1 + 4]
11. What are the applications of multimedia? Discuss. [5]
12. Write short notes on: [2 × 2.5 = 5]  
a. Big Data    b. Smart City

\*\*\*Best of Luck\*\*\*

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**(Introduction to Information Technology) SET B**

Full Marks: 60

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Time: 3 hours

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

### Long Questions (ANY TWO)

[2 \* 10 = 20]

1. What is communication protocol? Write about the different layers of OSI Model. [3 + 7]
2. What are the benefits of storing data using databases? Discuss three levels of database system architecture in detail. [3 + 7]
3. What is Operating System. Discuss the functions of OS in detail. (2+8)

### Short Questions (ANY EIGHT)

[8 \* 5 = 40]

4. List down the different ways in which software is made available to the users. Explain any two. [5]
5. Discuss the components of CPU in brief. [5]
6. Convert (AF7) to binary. Subtract (1001101) from (1100011) . (2 + 3)
7. Explain in detail the working of I/O System. [5]
8. What do you mean by Data transmission media? Write about Guided and Unguided media with examples. [1.5+3.5]
9. Define IP address with example. What are the benefits of using domain name? [2 + 3]
10. Define cryptography. Discuss public key cryptography in detail. [1 + 4]
11. What are the elements of multimedia? Discuss. [5]
12. Write short notes on: [2 × 2.5 = 5]  
a. Data Mining    b. Cloud Computing

\*\*\*Best of Luck\*\*\*

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**Qualifying Test 2075**

Bachelor Level/ First Year/ First Semester/ Science Full Marks: 60  
**Computer Science and Information Technology (CSc. 110)** Pass Marks: 24  
**(C Programming)** **SET A** Time: 1.5 hours  
**Attempt any two questions: 2\*10=20**

- 1) Define array. What are drawbacks of array? Describe different types of array with example.
- 2) What is function ? Describe different types of function with example.
- 3) What is file handling in C? What are the advantage of file handling. Create a text file and enter some text and create another text file which contain reverse of input text.

**Attempt any eight questions: 8\*5=40**

- 4) Explain switch statement with example.
- 5) WAP to accept two number and sort them using pointer.
- 6) Write an algorithm and draw flowchart to accept two number and display the greater number.
- 7) What is recursion explain with example.
- 8) WAP to convert given string into uppercase and count number of vowels in string
- 9) What is nesting of structure. Illustrate it with example.
- 10) What is DMA? Write advantage of DMA over array.
- 11) Why graphical function are used in programming. Show its basic functionalities with example.
- 12) Write short note on:

A) Debugging

B) Variable declaration

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Bachelor Level/ First Year/ First Semester/ Science Full Marks: 60  
**Computer Science and Information Technology (CSc. 110)** Pass Marks: 24  
**(C Programming)** **SET B** Time: 1.5 hours  
**Attempt any two questions: 2\*10=20**

- 1) Difference between structure and union. Illustrate passing array to structure concept with example.
- 2) What is recursion. What are advantages of using recursion? WAP to calculate  $x^y$  using recursion.
- 3) What is binary file? How it differ from text file? WAP to create a text file and enter string and create another text file which contain only small letter of input text.

**Attempt any eight questions: 8\*5=40**

- 4) Explain control statement. WAP to show use of break ,continue and exit statement.
- 5) What is function of pointer variable? Explain declaring and initialization of pointer variable with example.
- 6) Write an algorithm and draw flowchart to accept a number and check positive or negative or zero.
- 7) WAP to input 5 number and sort in ascending order and display average of its element.
- 8) Write the example showing passing pointer to function as argument.
- 9) WAP to convert given string into lowercase and count number of consonants.
- 10) Explain DMA in detail with its purpose and advantages over array.
- 11) Explain use of graphics in C along with its basic functionalities and examples.
- 12) Write short note on:

a) Delimiters

b) Formatted i/o

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# Lumbini ICT Campus

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## Qualifying Test 2075

Bachelor Level/ First Year/ First Semester/ Science

**Computer Science and Information Technology (PHY 113)**

**(Physics)**

**SET B**

Full Marks: 60

Pass Marks: 24

Time: 3 hours

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Attempt **ANY TWO** questions.

1. What is semiconductor? Describe its types. Describe the effect of temperature on the conductivity of n-type and p-type semiconductor.
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. State the fundamental postulates of Bohr's theory of hydrogen spectrum. Explain the existence of definite energy states on the basis of this theory.

Attempt **ANY EIGHT** questions.

4. What is black body radiation? What are the characteristics of spectrum observed in black body radiation?
5. Discuss effective mass of electrons and holes.
6. Describe the process of IC production.
7. Suppose the body of an ice skater has a moment of inertia  $4 \text{ kg m}^2$  and her arms have mass  $5 \text{ kg}$  each with the centre of mass at  $0.4 \text{ m}$  from her body. She starts to turn at  $0.5 \text{ rev/sec}$  on the point of her skate with the arms out stretched. She then pulls her arms inward so that their centre of mass is at the axis of her body is zero. What is the speed of rotation?
8. A current of  $50 \text{ A}$  is established in a slab of copper  $0.5 \text{ cm}$  thick and  $2 \text{ cm}$  wide. The slab is placed in magnetic field of  $1.5 \text{ T}$ . The magnetic field is perpendicular to the plane of the slab and to the current. The free electron in copper is  $8.4 \times 10^{28} \text{ electron/m}^3$ . What will the magnitude of Hall voltage across the width of slab?
9. The de-Broglie wavelength of proton is  $10^{-13} \text{ m}$ . a) What is the speed of the proton? b) Through what potential difference must the proton be accelerated to acquire such a speed?
- 10) For a free quantum particle, show the wave function  $\psi(x,y) = A \cos kx e^{-i\omega t}$  satisfies the time dependent Schrodinger equation.
- 11) Copper has a face centered cubic structure with a one atom basis. The density of copper is  $8.96 \text{ gm/cm}^3$ . and its atomic weight is  $63.5 \text{ g/mole}$ . What is the length of the unit cube of the structure?
- 12) Suppose that the effective mass of hole in a material is four times that of electrons. At what temperature would be Fermi level shifted by 10% from the middle of the forbidden energy gap? Let  $E_g = 1 \text{ eV}$ .

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# Lumbini ICT Campus

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## Qualifying Test 2075

Bachelor Level/ First Year/ First Semester/ Science

Computer Science and Information Technology (PHY 113)

(Physics)

SET A

Full Marks: 60

Pass Marks: 24

Time: 3 hours

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Attempt **ANY TWO** questions.

- 1) What do you mean by Bloch Theorem? Discuss its use in Kronig-Penny model and hence in band theory.
- 2) Describe moment of inertia and torque for a rotating rigid body. Find the expression for rotational kinetic energy and discuss the conditions for conservation.
- 3) Show that the energy of an electron is quantized in an infinite potential well hence determine the normalized wave function of the electron.

Attempt **ANY EIGHT** questions.

- 4) Explain Hall Effect and discuss the importance of Hall voltage while manufacturing electronic device.
- 5) Differentiate insulator, semiconductor and conductor on the basis of band theory.
- 6) What is flip flop? Discuss the operation of RS flip flop using NOR gate.
- 7) A large wheel of radius 0.4 m and moment of inertia  $1.2 \text{ kg m}^2$ , pivoted at the centre is free to rotate without friction. A rope is wound it and a 2 kg weight is attached to the rope. When the weight has descended 1.5 m from its starting position.
  - a) What is its downward velocity?
  - b) What is the rotational velocity of wheel?
- 8) Three charges  $q_1 = 3 \times 10^{-6} \text{ C}$ ,  $q_2 = 5 \times 10^{-6} \text{ C}$  and  $q_3 = -8 \times 10^{-6} \text{ C}$  are positioned on a straight line. Find the potential energy of the charges.
- 9) A small particle of mass  $10^{-6} \text{ g}$  moves along X-axis, its speed is uncertain by  $10^{-6} \text{ ms}^{-1}$ .
  - a) What is the uncertainty in the x-coordinates of the particle?
  - b) Repeat the calculation for an electron assuming that the uncertainty in its velocity is also  $10^{-6} \text{ ms}^{-1}$ .
- 10) Calculate the normal Zeeman splitting of the Calcium  $4226\text{\AA}$  line when the atoms are placed in a magnetic field of 1.2 Tesla?
- 11) The dissociation energy of the KF molecules is 5.12 eV. The ionization energy for K is 4.34 eV, and the electron affinity of F is 4.07 eV. What is the equilibrium separation constant for the KF molecules?
- 12) The average saturation current of a silicon diode doubles when the temperature changes from  $27^\circ\text{C}$  to  $33^\circ\text{C}$ . What is the position Fermi level on the P side of the junction?

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# LUMBINI ICT CAMPUS

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## Qualifying Test 2075

Bachelor Level/ First Year/ First Semester/ Science

Computer Science and Information Technology (MTH 112)

(Mathematics)

SET -B

FM: 80

PM: 32

Time: 3 hours

### Group A

Attempt ANY THREE questions.

1. a) A function  $f(x)$  is defined by,

$$f(x) = \begin{cases} x^2 - 1 & \text{for } x \leq 0 \\ x + 1 & \text{for } x > 0 \end{cases}$$

Evaluate  $f(-2)$ ,  $f(-1)$ ,  $f(1)$ ,  $f(2)$  and sketch the graph.

b) Find the value of  $\lim_{n \rightarrow 1} \left( \frac{x-1}{x^2-1} \right)$

2. a) Sketch the graph of  $f(x) = \frac{x^2}{\sqrt{x+1}}$

b) Find the area of the region enclosed by the curve  $f = x^2$  and  $y = 2x - x^2$ .

3. a) Solve  $y'' - y' = xe^x$ ,  $y(0) = 2$ ,  $y'(0) = 1$ .

b) Find the Maclaurin series for the function  $f(x) = x \cos x$

4. a) Find the length of the arc of the circular helix with vector equation  $\vec{r}(t) = \cos t \vec{i} = \sin t \vec{j} + t \vec{k}$  from  $(1,0,0)$  to  $(1,0, 2\pi)$

b) Evaluate  $\int_0^2 \int_{x^2}^{2x} (x^2 + y^2) dy dx$

### Group B

Attempt ANY TEN questions

5) Determine whether  $f(x)$  is one to one function or not where  $f(x) = 2 + x$ .

6) Define asymptotes to a curve. Find the asymptotes (if exists) to the curve  $y = \frac{2x^2}{1-x}$

7) State and prove Rolle's theorem. Verify the theorem by the function  $f(x) = \sqrt{x} - \frac{x}{3}$  on  $[0, 9]$ .

8) Find the point on  $y^2 = 2x$  that is closest to the point  $(1, 4)$ .

9) If  $f(x) = x^2 - 2x$  for  $0 \leq x \leq 3$  evaluate the Riemann sum with  $n = 6$ , taking the sample points to the right endpoints. What does the Riemann sum represent?

10) Find the volume of the solid that is obtained by rotating region about y-axis which is bounded by curves  $y = 2x^2 - x^3$ ,  $y = 0$ .

11) Solve the differential equation:

$$y(1+xy) dx - x dy = 0, y(1) = 1.$$

12) Test the convergence of an infinite series  $\sum_{n=1}^{\infty} \frac{n^2(n+1)^2}{n!}$

13) Show that the curvature of a circle of radius  $a$  is  $1/a$ .

14) Does  $f(x,y)$  exists as  $(x,y) \rightarrow (0,0)$  where  $f(x,y) = \frac{x^2 - xy}{\sqrt{x} - \sqrt{y}}$

15) State the Euler's mixed derivative theorem for partial differentiation. Verify the theorem by the function  $w = x \sin y + y \sin x + xy$

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# LUMBINI ICT CAMPUS

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## Qualifying Test 2075

Bachelor Level/ First Year/ First Semester/ Science

**Computer Science and Information Technology (CSC 111)**

**(Digital Logic)**

**SET -A**

FM: 80

PM: 32

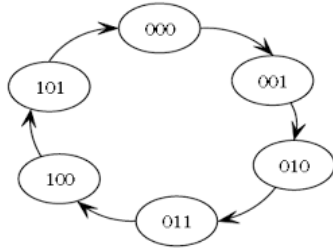
Time: 3 hours

### Long Question:

1. Implement the following function  $F = \sum(0,3,5,6,7)$  using

- Decoder
- Multiplexer
- PLA

2. Differentiate between PAL and PLA. Design a counter as shown in the state diagram below:



3. Draw a block diagram, truth table and logic circuit of  $1 \times 16$  Demultiplexer and explain its working principle.

### Short Question:

4. Perform the arithmetic operations  $(+42) + (-13)$  and  $(-42) - (-13)$  in binary using signed 2's complement representation for negative numbers.

5. Express the complement of the following function in sum of minterms:

$$F(A,B,C,D) = \sum(0,1,3,9,11,14)$$

6. Reduce the following function using k-map

$$F = wxy + xyz + xy'z' + x'y'z$$

7. Design a combinational circuit with three inputs and six outputs. The output binary number should be the square of the input binary number.

8. Design a  $5 \times 32$  decoder with four  $3 \times 8$  decoder with enable and one  $2 \times 4$  decoder. Use block diagrams only.

9. Design and explain the 2-bit magnitude comparator with truth table and suitable diagram.

10. Explain the SISO and SIPO shift register. Write down its application.

11. Explain master slave J-K flipflop.

12. Write short notes on (any two):

- D flip flop
- Johnson's counter
- De-Morgans Theorem

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## Qualifying Test 2075

Bachelor Level/ First Year/ First Semester/ Science

**Computer Science and Information Technology (CSC 111)**

**(Digital Logic)**

**SET -B**

FM: 80

PM: 32

Time: 3 hours

### Long Question:

1. Implement the following function  $F = \sum(1,3,5,7)$  using
  - a. Decoder
  - b. Multiplexer
  - c. PLA
2. Design and Implement with logic diagram, truth table and timing diagram of synchronous 3 bit up/ down counter using J-K Flip Flops.
3. Differentiate between ROM and PLA. Design a Master-slave S-R flip flop with logic diagram and truth table.

### Short Question

4. Perform the arithmetic operations  $(+32) + (-12)$  and  $(-32) - (-12)$  in binary using signed 2's complement representation for negative numbers.
5. Express the complement of the following function in sum of minterms:  
 $F(A,B,C,D) = \sum(0,2,4,6,8,12,14)$
6. Reduce the following expression using k-map:  
 $F = (A+B)(A+B'+C)(A+C')D$
7. Design a combinational circuit with three inputs x,y and z and three outputs, A,B and C. When the binary is less than or equal to 3, the binary output is one greater than the input. When the binary input is greater than four (4) the binary output is one less than the input.
8. Design a 32\*1 MUX using 8\*1 MUX. Use block diagrams only.
9. Design and explain the Decimal adder with truth table and suitable diagram.
10. Explain PIPO and PISO shift register. Write down the practical implementation of shift register.
11. Explain J-K flip flop. What is race around condition? How J-K flip flop overcome the race condition?
12. Write short notes on (Any two):
  - a. Sequential Circuit Design Procedure
  - b. Memory Unit
  - c. Ring Counter

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