MASENO UNIVERSITY
UNIVERSITY EXAMINATIONS 2024/2025

SECOND YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE, COMPUTER TECHNOLOGY AND MATHEMATICS AND COMPUTER SCIENCE

MAIN CAMPUS

CIR 209: LAN DESIGN AND IMPLEMENTATION

Date: 22nd January, 2025 Time: 12.00 - 3.00pm

INSTRUCTIONS:

- Do not write anywhere on this Question paper
- Answer Question ONE and any other TWO.

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QUESTION ONE

a) Explain the term protocol as used in networking. (2 marks)

b) Describe any three transmission media in a computer network (6marks)

c) Explain any three classes of local area Networks (6 marks)

d) Briefly describe the following under data transmission in networks

i. Packet switching

ii. Circuit switching (4 marks)

e) Explain the following

i) Baseband vs. Broadband

ii) Serial vs. Parallel transmission modes (4 marks)

f) Give 5 types of servers you may find on a network and explain their function(5 marks)

g) Highlight any three network software (3 marks)

QUESTION TWO

(a) List 4 functions of a networks administrator (4 marks)

(b) Give 2 advantages of the OSI reference layer model (2 marks)

(c) List and explain the functions of any **four** of the 7 layers of the OSI reference model (8 marks)

d) Describe briefly the following network architectures: (6 marks)

i. Ethernet

ii. Token ring

iii. Apple Talk

QUESTION THREE

(a) List 6 factors to consider when designing a network. (6 marks)

(b) With the aid of diagrams, state and explain 3 network topologies (6 marks)

(c) List the functions between the following devices and thereby differentiate them

i) Hub

ii) Switch

iii) Router

iv) Bridge (8 marks)

QUESTION FOUR

(a) Explain what you understand as an access method in networking and explain 3 access methods (8 marks)

(b) A packet is divided into 3 main parts. List them and explain them. Use a diagram if necessary. (6 marks)

(c) Briefly explain the following terms as applied to desirable network design

i) Resource sharing

ii) Network reliability

iii) Computer network resource and management (6 marks)

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SECOND YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

MAIN CAMPUS

CIR 201: RESEARH METHODS AND TECHNICAL WRITING

Date: 23rd January, 2025 Time: 12.00 - 3.00pm

INSTRUCTIONS:

- Do not write anywhere on this Question paper
- Answer ALL Questions in Section A and any other TWO in Section B.

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SECTION A {30 MARKS}

Q1. (a) Precisely outline the major difference between research hypothesis and research question. [6 marks]

(b) Briefly, outline any THREE forms of unethical behaviour in research undertaking. [6 marks]

(c) State the THREE perspectives from which types of research can be classified. [6 marks]

(d) Briefly discuss how experience and creativity are two major factors that influence the choice of a researchable question [6 marks]

(e) Clearly and precisely give a definition of the term **research** from academic view point. [3 marks]

(d) Briefly outline the main difference between Applied and Basic Research with respect to their main goals. [3 marks]

SECTION B {20 MARKS EACH}

Q2. As a student researcher, you have a task to come up with a research problem. Briefly outline FIVE

(a) Sources from where you can identify a researchable problem [10 marks]

(b) Qualities of what is considered as good research. [10 marks]

Q3. Imagine you are a student researcher and at the end of your research undertaking you are expected to prepare a research project report that is considered standard for presentation before a Project Panel. In order to prepare such a report

(a) Briefly discuss the key factors to take into consideration. [10 marks]

(b) Give an outline of its structure [10 marks]

Q4. (a) With the aid of a well-labelled diagram, show the key steps in undertaking any research work [10 marks]

(b) As a student researcher briefly explain how a computer system in your own view is considered a handy tool for any research undertaking. [10 marks]

Q5. (a) Briefly outline the FIVE main chapters that constitute a typical research project report. [15 marks]

(b) Give reasons why by and large, the idea of Bibliographic Citations and Referencing has become one of a great significance in research works as well as in other technical writings generally. [5 marks]

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SECOND YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MATHEMATICS & COMPUTER SCIENCE

MAIN CAMPUS

CIR 203: DATA STRUCTURES AND ALGORITHMS

Date: 16th January, 2025 Time: 12.00 - 3.00pm

INSTRUCTIONS:

- Do not write anywhere on this Question paper
- Answer Question ONE and any other TWO.

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CIR 203: Data structures and algorithms

Question 1 (30 marks)

1. Explain the difference between linear and nonlinear data structures. Explain two examples of each **(4 marks)**
2. Explain the below concepts as used in Graphs **(3 marks)**
   a. Vertex
   b. Edge
   c. Path
3. Convert the following infix expressions (A + B) · (C + D) · (E + F) to prefix (use full parentheses) **(2 marks)**
4. Explain the difference in the following types of graphs **(3 marks)**
   a. Digraph
   b. Weighted graph
   c. Cyclic graphs
5. A company wishes to have a representation of their local area network. Give the data structure that is most appropriate for this purpose, stating the reasons for your choice **(3 marks)**
6. What is hashing? Explain with example. **(2 marks)**
7. Define an algorithm and hence explain the following algorithm strategies with appropriate examples, explain the following algorithm design paradigms **(4 Marks)**
   a. Divide and conquer
   b. Dynamic programming
8. Write a program pseudo code to remove last node of the linked list. **(2 marks)**
9. Using the O-notation, explain the running time of the following equations **(3 Marks)**
   a. $f(n) = 100n^3 - 7n^3 + 14n^2$
   b. $f(n) = 5 \log \log n + 4 \log^2(n)$
   c. $f(n) = 100n^3 - 100n^3 + 7n^2$
10. Derive the running time of the following section of an algorithm; clearly show how you arrived at your solution. **(4 Marks)**

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```
int f4(int n) {
  if (n < 10) {
    System.out.println("!");
    return n+3;
  } else {
    return f4(n-1) + f4(n-1);
  }
}
```

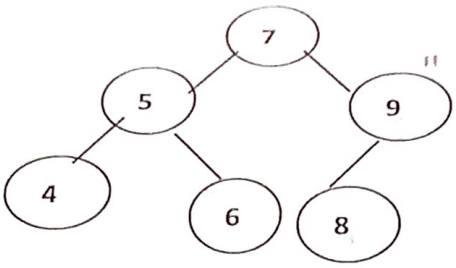
a.

b.

```
float sum(float age[],int n)
{
float temp=0; 1
int i; 2
for(i =0 3 ; i<n 4 ; i++ 5)
temp +=7 age[i]6 ;
return temp; 8
}
```

Questions 2 (20 marks)

1. Explain how one would insert the value 11 in the BST below **(2 marks)**



2. Evaluate the below postfix expression - 2 3 · 4 + Show the stack as each operand and operator is processed. **(2 marks)**
3. Create a BST using the following set of values. 67, 45, 110, 26, 12, 89, 33, 115, 230, 412, 48, 71, 10, 98, 5, 139, 21. **(6 marks)**
4. Traverse the above tree using Inorder traversal **(4 marks)**
5. Outline the basic idea of selection sort algorithm, and use it to sort the following elements: 6, 4, 15, 12, 2, 1 **(6 marks)**

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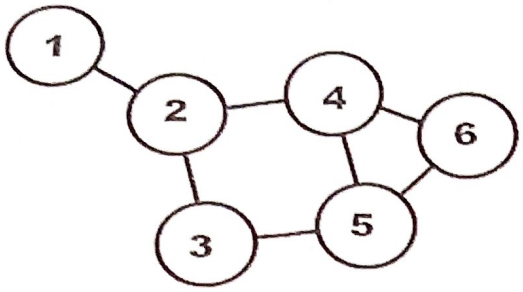
Question 3 (20 marks).

1. Using an example, explain the spanning tree and minimum spanning tree and list some properties of spanning trees (6 marks)

2. Draw an adjacency matrix for the graph shown below. (2 marks)



3. Use the depth first search algorithm to traverse the above graph. Show the state of the stack at every step of the traversal. (6 marks)
4. Use the breath first search algorithm to traverse the above graph. Show the state of the queue at every step of the traversal (6 marks)

Question 4 (20 marks)

1. Create an AVL tree using the following data and show the balance factor in the resulting tree: 14, 23, 7, 10, 33, 56, 80, 75, 90 (8 marks)
2. An array contains the elements shown below: 44, 78, 22, 7, 98, 56, 34, 2, 38, 35, 45 Arrange the elements of the array using quick sort and merge-sort (8 marks)

3. Convert the expression ((A + B) * C – (D – E) ^ (F + G)) to equivalent Prefix and Postfix notations. (4 marks)

Question 5 (20 marks)

1. A friend has consulted you on coming up with a software for his fresh product shop. He wishes to ensure that all products take the shortest time possible, by selling the products in the order they came. What data type, and data structures would you recommend for this implementation? Give reasons for your answer **(2 marks)**

2. The study of efficiency of algorithms is the amount of resources they used in terms of space and time. Explain the two ways of measuring these qualities. **(3 marks)**

3. Write an algorithm to delete (a) First node (b) Last node (c) Any desired node from a singly list. **(9 marks)**

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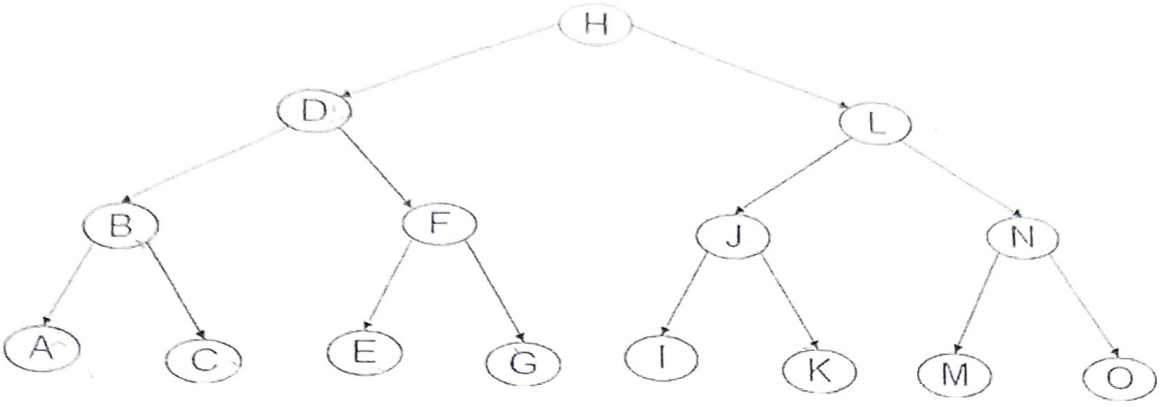
4. Traverse the given tree in Pre-order and post-order, in each case show the output.

(6 Marks)



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SECOND YEAR FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND BACHELOR OF EDUCATION SCIENCE WITH INFORMATION TECHNOLOGY

MAIN CAMPUS

CCS 219: SYSTEMS AND PROCEDURAL PROGRAMMING

Date: 30th January, 2025 Time: 12. 00 - 3. 00 pm

INSTRUCTIONS:

- DO NOT write anywhere on this question paper
- Answer all questions in SECTION A and any other TWO from SECTION B
- Fasten together all loose answer sheets used
- No mobile phone in the examination room

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SECTION A: ANSWER ALL QUESTIONS

Question one (30 Marks)

a) State the functions of Process control subsystem of UNIX. (4 marks)

b) Differentiate between the following terms/phrases as used in C programming using relevant examples.

i) A variable and a constant. (2 marks)

ii) Scanf and printf. (2 marks)

iii) Function prototype and function definition. (2 marks)

c) Describe the three types of accounts on a Unix system. (3 Marks)

d) Write a program in C language that will receive three integer numbers from the keyboard then determines and displays the biggest number of the three on the screen. (3 marks)

e) Write a UNIX command line statements that will do the following

i) Create a directory called project1 on project directory (1 mark)

ii) Deletes a directory called notes that contains other directories (1 mark)

f) Write a C program that will accept three floating point numbers from the keyboard, compute their sum and print the result on the screen. (3 marks)

g) State and briefly describe three ways that can be used to implement inter-process communication (IPC) synchronously. (6 Marks)

h) Write a C program that will generate integer numbers between1 and 3000 that are divisible by 11, compute their sum then display the numbers and their sum on the screen. (3 marks)

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SECTION B: ANSWER ANY TWO QUESTIONS

Question Two (20 marks)

a) Briefly explain the following common UNIX server software. (8 marks)

i. Domain Name System

ii. Telnet

iii. File transfer protocol

iv. World Wide Web

b) Use a five-state process model to explain the process state transition in UNIX operating system. (6 Marks)

i) Describe briefly any three algorithms that can be used to allocate memory for a new process or an existent process that has to be swapped in. (6 marks)

Question Three (20 Marks)

a) State four advantages of using functions in C programming. (4 marks)

b) Write a C program that receives three decimal numbers from the keyboard then uses both function prototype and function definition to computes their sum and displays the result on the screen. (7 marks)

c) What is a control structure?. Write a C program that demonstrate how a switch decision construct works. (6 marks)

d) Write a program that will compute the product of integer numbers between1 and 500 that are divisible by 7 then display the result on the screen. (3 marks)

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Question Four (20 Marks)

c) Draw a well labelled block diagram showing the design of a Unix Operating system and briefly explain the functions of its various components. (17 Marks)

d) Explain the three modes in which a vi text editor can operate. (3 Marks)

Question Five (20 Marks)

a) Compare between an array and a structure in C programming language. (4 Marks)

b) Declare a record called Refugee that has the following fields: identityNo, name, gender, of type string, age of type integer, native country of String, hosting country of type string and camp of type string. (3 marks)

c) Write a program segment that declares a variable of type Refugee and assign values to each field. (3 marks)

d) Write a C program segment that declares a single dimensional array called RefugeeRecord of type Refugee that can contain records of 10 refugees entered from the keyboard. (3 marks)

e) Write a C program that will print the records of the ten refugees on the screen. (3 marks)

f) String is considered as an array of characters in C programming language.

   i) Write a program statement that will declare and initialize a string of 10 elements. (1 marks)

   ii) Use appropriate examples to explain the use of gets() and puts() functions as applied on strings. (3 marks)

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THIRD YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE, BACHELOR OF SCIENCE COMPUTER TECHNOLOGY, BACHELOR OF SCIENCE IN MATHEMATICS & COMPUTER SCIENCE AND BACHELOR OF EDUCATION SCIENCE

MAIN CAMPUS

CIR 205: OBJECT ORIENTED PROGRAMING II

Date: 31st January, 2025 Time: 12.00 - 3.00pm

INSTRUCTIONS:

- Do not write anywhere on this Question paper
- Answer Question ONE and any other TWO.

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Question 1 (30 Marks)

(a) Explain the following terms as used in Object Analysis and Design and give an example:
   i. Instance.
   ii. Message.
   iii. Polymorphism
   iv. Object (4 marks)

(b) Using a suitable example, explain the difference between abstract and concrete class (2 marks)

(c) Identify four Event Listeners you can use when writing Java programs. (4 marks)

(d) Explain four benefits of Object Oriented system development. (2 marks)

(e) The gross salary of employees at West lands merchants is based on basic salary and commission earned from sale of various products in the store. The table shows the monthly sales target and possible commissions to be earned .Use it to generate a Java program and use the input and message dialogue boxes to capture and display the results from your program (5marks)

Monthly Sales	Commission rate
Above 40000	20%
Between 20000 and 40000	15%
Below 20000	10%

(f) Discuss the at least four types of layout managers and show how each is used (8marks)

(g) Write a Java GUI program that generates the form shown below. The program should compute and display the results of two numbers entered on clicking the "Add" button. (5 Marks)

Number Addition

First Number:

Second Number:

Result:

Add Clear

Exit

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QUESTION 2

a. Explain in detail why the following lines are included at the beginning of the program (3mks)

   i. import java.awt.*
   ii. import java.awt.event.*,
   iii. import javax.swing.*

b. Explain the following key concepts of the following in event classes in object oriented programing (6marks)

   i. Event Handler
   ii. Event Sources
   iii. Event Listeners

c. Explain the meaning of the following functions as used in a piece of the code (5mks)

   i) label2.setToolTipText("This is label2")
   ii) label3.setText("Label with icon and text at bottom");
   iii) label3.setIcon(bug);
   iv) label3.setHorizontalTextPosition(SwingConstants.CENTER);
   v) container.add(label3);
   vi) f.addMouseListener(new MouseAdapter()

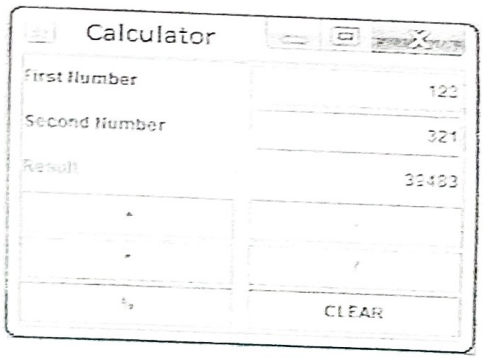
d. Write a program to calculate area of circle and display results in text field (5 marks)

QUESTION 3

a. Describe the following events indicating the listener interface for each of them (12 marks)

   i. Action Event
   ii. Mouse Event
   iii. Key Event
   iv. Item Event
   v. Text Event
   vi. Window event

b. Write a sample calculator consisting of addition button, subtraction button, multiplication button, two text fields and a label such that a user enters numbers in the two text field and when he clicks either of the buttons the result is displayed in the label. Sample guiding interface is shown below (8 marks)



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QUESTION 4

a. Define the term GUI (1mark)

b. State at least two advantages of GUI (2marks)

c. With aid of examples, explain how **super** keyword is used (2 marks)

d. Define java package and outline the benefits of packages. (3 Marks)

e. Using appropriate examples outline THREE control structures used when writing java programs. (6 Marks)

f. With Aid of an example show how the following functions are used in GUI (6 Marks)

   i. setVisible()
   ii. setSize()
   iii. setEditable-

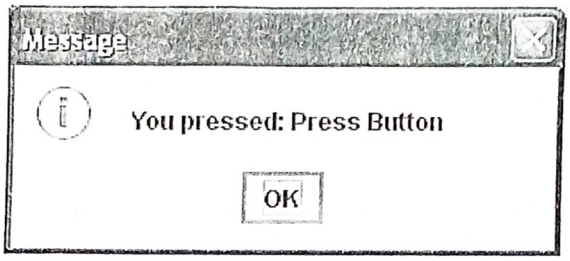
✓ **QUESTION 5**

a. Define the term Layout manager (2 marks)

b. Write a java program that will display at least three JLabels a (6marks)

c. Write a program that will display the figure bellow (6marks)

d. Modify the program in (c) above such that when the button is clicked a dialog box below is displayed (6marks)



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