PART A
All questions are compulsory. Each question carries 4 marks

1. Distinguish between Inline functions and macros.
2. What is the purpose of copy constructor? Explain with an example.
3. When do we use the keyword protected with a data member?
4. Explain syntax of class template with an example showing class definition and object definition.
5. Distinguish between overloading and overriding.

(5 * 4 marks = 20 marks)

PART B
Answer one question from each module. Each question carries 20 marks.

MODULE I

6. (a) Write a function called Smaller() that is passed with two int arguments by reference and then sets the smaller of the two arguments to 0. Write a main() program to test this function.

(b) Distinguish between the following terms:
(i) Inheritance and polymorphism (ii) Data abstraction and data encapsulation

(12)

7. (a) Write an overloaded function power() to raise a number \( m \) to to \( n \). The function takes int type as well as double type value for \( m \) and an int type value for \( n \). Use a default value of 2 for \( n \) to make the function to calculate squares when this argument is omitted. Write a main program that takes the values of \( m \) and \( n \) from the user to test the function.

(b) Distinguish between the following terms:
(i) Objects and classes (ii) Dynamic binding and message passing

(12)

MODULE II

8. (a) Write a class to represent a vector (a series of float values). Include member functions to perform the following tasks:

(i) To create the vector  (ii) Modify the value of a given element  (iii) Multiply by a scalar value  (iv) Display the vector

(8)
Write a main program to test your class. (14)
(b) When do we declare a member of a class static? (6)

9. (a) Define a class String that could work as a user defined string type. Include constructors that will enable to create an uninitialized string object and an object with a string constant initialized a member function to concatenate two strings and another member function to display string objects. Write a main program to test your class. (14)
(b) What is a friend function? What are the merits and demerits of using friend functions? (6)

MODULE III

10. Write a C++ program to create a class called Counter with the following functionalities.
    (i) Automatic Counter initialization
    (ii) Incrementing counter using ++ operator (use friend function)
    (iii) Decrement using -- operator
    (iv) Comparison for equality using ==
    (v) Display count value using operator <<.

Write a main program to test this class. (20)

11. Create a base class called shape. Use this class to store two double type values that could be used to compute the area of figures. Derive four specific classes called triangle, rectangle, square and circle from the base class shape. Add to the base class, a member function get_data( ) to initialize base class data members and another member function display_area( ) to compute and display the area of figures. Make display_area( ) as a virtual function and redefine this function in the derived class to suit their requirements. Using these five classes design a program that will accept dimensions of a triangle, square or circle interactively and display the area. (20)

MODULE IV

12. (a) Write a C++ program to implement a generic stack class. Include a default constructor, destructor and member functions push( ) to put values into the stack, pop( ) to remove values from stack, isempty( ) and isfull( ) for testing whether stack is empty or full. Use array implementation of stack. Write a main program to test your class for integer and character type data. (14)
(b) What is a stream? How is cout able to display various types of data without any special instructions? (6)
13. (a) Write a program to create file containing a list of telephone numbers in the following form.

John     23456
Ahmed    98765

The name contains only one word and the names and telephone numbers are separated by white spaces. Use a class object to store each set of data. Write a program to read the file and output the list in two columns. The names should be left justified and the numbers right justified.

(b) (i) What is an exception specification? When is it used? (5)
    (ii) When do we use multiple catch handlers? (5)

(4 * 20 marks = 80 marks)