I/E/TY

Reg. No: 24BCE2127

Final Assessment Test – April 2025

VIT
Vellore Institute of Technology

Course: BCSE102L - Structured and Object-Oriented Programming

Class NBR(s): 1456/ 1479/1497/1517/1554/1562/1574/ 1587/1593/1662/1664

Slot: G2

Time: Three Hours

Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions
(10 X 10 = 100 Marks)

1. Compare the following C programming statements with a suitable code snippet:
   a. While and do-while. [5]
   b. If-else-if ladder and switch case. [5]

2. The National Centre for Seismology, India has recorded the detail of earthquakes in India using the Richter Magnitude Scale. Develop a C program to get the details of the earthquakes occurred in 2024 and using functions to print the number of times in which the magnitude was low, medium, and high. The magnitude value is given in microns. If the value is less than 5.4 (inclusive) in microns then it is low, 5.4 to 7.0 (inclusive) is medium and more than 7.0 it is high. If there is no earthquake in the given year then print "No Earthquake". Use a sample input and output to validate the code.

   Input: Get the number of times (n) the earthquake has occurred, and get the magnitude in microns for each earthquake that occurred.

   Output: Print the count of 'low', 'medium', and 'high'.

   (For example: Low: 5, medium: 3, high: 2).

3. In C programming, show how would you allocate, reallocate and deallocate memory during runtime. Discuss the functions used for the same with neat syntax and a sample program.

4. Develop a C program to implement the operations of a bookshop system using an array of structures. A bookshop system maintains the inventory of 'n' number of books that are available at the shop. The detail of the book includes title, author, price, and stock position (No. of copies available). Whenever a customer requests a book, the salesperson inputs the title and no. of copies required. The system searches the list and if the books are available, then displays the 'total cost', otherwise print "Book not available". However, if the book is available but the number of copies is not available, then print "Requested number of copies not available". Use a sample input and output to validate the code.

5. List down the characteristics of the constructor in C++. With a suitable example program, show how you declare and initialize an object using another object of the same class.

6. Develop a C++ program to compute the monthly salary of 'n' employees on the last working day. Design an 'Employee' class with necessary data members (id, name and salary) and member functions (getdetails() and printdetails()) to read and display the employee details. Create a new class 'Attendance' that inherits the 'Employee' class should have necessary data members to get the attendance percentage of all the employees for the current month. Create another class 'Salary' that inherits the 'Attendance' class should have necessary member functions to compute and print the total salary of each of the employee. If the employee has more than 90% of attendance, a bonus of 10% salary can be added to the total salary. Provide a sample input and output to validate the code.

7. a) Why do we need virtual function? Discuss in detail with a suitable program. [7]
   b) List the operators that cannot be overloaded. [3]

8. A company maintains an inventory of products, each identified by:

   a. Product ID (integer)
   b. Product Price (float)
   c. Product Name (String)

   The company wants the ability to sort these attributes individually (ascending order) using a single function. Develop a C++ program to implement the above requirement and discuss the C++ concept used in it.

9.a) Develop a C program to get a Date of Birth (DoB) from the user and use functions to check whether it is a lucky day or not. The DoB should be an 8-digit number (DDMMYYYY) and the year of birth should be either 2005 or 2006 otherwise print 'Invalid input'. The steps followed to check whether the DoB is a lucky day or not is given below:

   Step-1: Calculate the sum of the digits in the odd-numbered positions (the first, third, fifth, and seventh digits) and multiply this sum by 3.

   Step-2: Calculate the sum of the digits in the even-numbered positions (the second, fourth, sixth, and eighth digits) and add this to the previous result (got in step 1).

   Given Date of Birth is declared as a 'Lucky day', only if the last digit of the result from step 2 is 0 otherwise print "Not a Lucky day". Use sample input and output to validate the code.

OR

9.b) Assume you are developing a text-processing application where users enter a string, and the program should do the following:

   i. Determine whether the string is a palindrome or not. The application should ignore case, spaces, and special characters while checking for a palindrome.
   ii. Count the number of characters other than vowels and white space.

   Develop a C program to implement the above requirements and provide a sample input and output to validate the code.

10.a) A tollbooth is located in the national highways between Vellore and Chennai. All the private vehicles passing the tollbooth are expected to pay an amount of Rs.250 and government vehicles should pay a toll amount of Rs.100. However, for ambulance, it is totally free. Develop a menu-driven based C++ program to implement the operations of a tollbooth that keeps track of the number of vehicles that have passed and the total toll amount collected on a given day. Create a class "tollbooth" with the data members:

- tnvp - total number of vehicles passed.
- ttac - total toll amount collected.

Implement the necessary member functions:

- A constructor to initialize the necessary data members.
- paying_vehicle(): when any vehicle passes through the tollbooth, the corresponding vehicle toll amount gets added into total toll collected and total number of vehicles passed is incremented by one.
- non-paying vehicle(): increments the vehicles total but adds nothing to cash total.
- display(): displays total no. of vehicles passed and the total toll amount collected.

OR

10.b) Develop a C++ program to implement the banking operations of 'n' customers. The bank offers fixed deposit accounts with an annual interest of 10% for the balance available in the account. Define a class "customer" to store the following data: *customer name (public), customer account number (public) and amount (private)* to be deposited. At the end of each year, the program should calculate the interest and provide the total balance available of all the customers. Use member function to read the customer data and *friend function* to calculate and print the total interest amount paid to the customers.

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