



School of Computer Science and Engineering

Winter Semester 2023-24

Continuous Assessment Test – II

SLOT:C1

Programme Name & Branch: B.Tech(Computer Science and Engineering)

Course Name & Code: Structured and Object-Oriented Programming (BCSE102L)

Class Number (s): Common to All C1 Slots

Faculty Name (s): Dr. Senthilkumar K

Exam Duration: 90 Min.

Maximum Marks: 50

General instruction(s):

Since CAT -2 will be conducted in open book mode, Students can carry handwritten notes and/or text books

Answer ALL the Questions(5 * 10 = 50 marks)

Carefully read the following scenario, which will be helpful for ALL the questions that follow:

In Bombay, Jass, a skilled software engineer, was approached by TechGenius, a local startup, to contribute to their smart home automation project, "HomeGenius." Recognising the potential, Jass suggested an object-oriented approach, proposing a "Device" class to serve as the foundation for all devices, with specialised subclasses for specific functionalities. Jass then suggested deriving specialised device classes from the base "Device" class, like such as lights, thermostats, and security cameras. Each device would have common attributes like an ID, name, and status. Jass emphasised the importance of encapsulation, suggesting that private member variables should store device-specific details. Sakthi, TechGenius's CEO, embraced Jass's ideas, acknowledging the benefits of encapsulation and inheritance. They saw how this approach would facilitate scalability and adaptability, allowing for seamless integration of new devices in the future. Together, they aimed to create a system that could efficiently meet evolving technological and customer demands.

Q. No.	Question	Max Marks
1	Write a C program that defines a structure named "Device" with pointer attributes including an ID (integer), name (string), and status (boolean). Additionally, define a nested structure called "Light" within "Device," which features pointer attributes such as Watts (integer) and Light Type	10

	(Modern/Classic). Implement a main() function to test the structure variables, utilising dynamic memory concepts (malloc()/calloc() function) for the pointer attributes in both structures (Device and Light). Furthermore, ensure the main() function reads values for these attributes and prints the results accordingly	
2.	How does encapsulation, achieved through securely bundling device-specific details within the "Device" class and utilising friend functions, enhance data security and abstraction in "HomeGenius"? How does this cohesive approach align with Abstract Data Type (ADT) principles, ensuring scalability and modularity? Discuss with examples.	10
3.	Develop a C++ program featuring a class "Device" with private attributes including ID (integer), name (string), and status (boolean), alongside a static attribute tracking the total number of devices created. Implement dynamic memory allocation within the constructor and include a copy constructor to facilitate deep copying of objects. Employ a destructor for memory deallocation and integrate a static member function to retrieve the count of devices. Showcase the program's functionality by dynamically creating two device objects and displaying their details. Lastly, ensure proper memory management by deallocating memory after usage.	10
4.	Explain the pivotal role of inheritance in "HomeGenius" smart home automation project. How does inheritance foster code extensibility and maintainability? Elaborate on how specialised device classes derived from the base "Device" class contribute to the project's scalability and adaptability, ensuring seamless integration of new devices to meet evolving technological and customer demands.	10
5.	In the HomeGenius smart home system, there is a need to represent a special type of device called "SmartSpeakerDevice" that combines the functionalities of both a regular device and a voice-controlled assistant. Implement a class called "SmartSpeakerDevice" that inherits from both the "Device" class and the "VoiceAssistant" class (having a single string attribute named "voice-controlled assistant"). Write a C++ program that demonstrates the concept of multiple inheritance and test the "SmartSpeakerDevice" class by creating an object in the main() function.	10