B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Seventh Semester

Information Technology

(Common to Artificial Intelligence and Data Science, Computer Science and Engineering, Electronics and Communication Engineering & Electrical and Electronics Engineering)

20ITEL901 - ADVANCED C++ FOR EMBEDDED PROGRAMMING

Regulations - 2020

Duration: 3 Hours   Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)
Answer ALL Questions

		Marks	K – Level	CO
1.	Operator overloading is also called …………….. Polymorphism. (a) run time (b) initial time (c) compile time (d) completion time	1	K1	CO1
2.	……………. overloaded through a member function take one explicit argument and those which are overloaded through a friend function take two explicit arguments. (a) Unary operators (b) Binary operators (c) Arithmetic operators (d) Function operator	1	K2	CO1
3.	Operator overloading is done with the help of a special function called ……………, which describes the special task of an operator. (a) overloading function b) special task function c) detail function d) operator function	1	K1	CO1
4.	The ……………. inherits some or all of the properties of the ……….. Class. (a) base, derived (b) derived, base (c) derived, initial (d) base, final	1	K1	CO2
5.	A member declared as ………….. is accessible by the member functions within its class and any class immediately derived from it. (a) protected (b) private (c) public (d) friend	1	K2	CO2
6.	What will be the order of execution of base class constructors in the following method of inheritance? class A: public B, public C {….}; (a) B(); C(); A(); (b) C(); B(); A(); (c) A(); B(); C(); (d) B(); A(); C();	1	K1	CO2
7.	C++ supports run time polymorphism with the help of virtual functions, which is called …………….. binding. (a) dynamic (b) run time (c) early binding (d) static	1	K1	CO3
8.	What is a pure virtual function in C++? (a) A virtual function with no implementation in the base class (b) A function that cannot be overridden (c) A function that can be called directly (d) A function with default implementation	1	K1	CO3
9.	What is a virtual table (vtable)? (a) A data structure used for managing memory (b) A table used for handling virtual function calls (c) A table that stores static member variables (d) A table for tracking object sizes	1	K1	CO3
10.	What are the containers? (a) Containers store objects and data (b) Containers stores all the algorithms (c) Containers contain overloaded functions (d) Containers contain set of Iterators	1	K1	CO4
11.	Which function can be used to find the sum of a vector container? (a) findsum() (b) accumulate() (c) calcsum() (d) checksum()	1	K1	CO4

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

13302

12. What is the primary purpose of the C++ Standard Library? (a) It provides basic I/O functionalities only (b) It contains a collection of pre-built data structures and algorithms (c) It enables dynamic memory allocation (d) It handles exceptions and errors	*1*	*K2*	*CO4*
13. In C++, which of the following is used for thread synchronization across different threads? (a) std::atomic (b) std::condition_variable (c) std::mutex (d) All of the above	*1*	*K2*	*CO5*
14. What is the main use of a semaphore in multithreading? (a) Managing multiple threads in critical sections (b) Creating threads (c) Destroying threads (d) Sending signals to threads	*1*	*K1*	*CO5*
15. Which of the following IPC methods allows two processes to communicate by writing and reading messages to and from a common memory location? (a) Message queues (b) Shared memory (c) Semaphores (d) Pipes	*1*	*K1*	*CO5*
16. In C++, what type of lock allows multiple readers but only one writer? (a) Spinlock (b) Read-write lock (c) Mutex (d) Semaphore	*1*	*K1*	*CO5*
17. How do you control the voltage level (HIGH/LOW) of a GPIO pin in a Raspberry Pi using C++? (a) writePin() (b) digitalWrite() (c) gpioSetVoltage() (d) controlPin()	*1*	*K1*	*CO5*
18. Which Linux command is used to compile a C++ program for controlling Raspberry Pi components? (a) gcc (b) g++ (c) make (d) compile	*1*	*K2*	*CO6*
19. What is the purpose of the delay() function in the wiringPi library when controlling components on the Raspberry Pi? (a) To turn off the GPIO pins (b) To introduce a time delay in milliseconds (c) To configure a PWM signal (d) To set the pin as an output	*1*	*K1*	*CO6*
20. How do you control a servo motor connected to a Raspberry Pi using the pigpio library? (a) By sending a digital signal using digitalWrite() (b) By using the gpioServo() function to set the pulse width (c) By writing an analog value with analogWrite() (d) By toggling the GPIO pin between HIGH and LOW states	*1*	*K1*	*CO6*

PART - B (10 × 2 = 20 Marks)
Answer ALL Questions

21. Write a C++program to count the number of objects of a certain class.	*2*	*K2*	*CO1*
22. Compare aggregation vs composition.	*2*	*K2*	*CO1*
23. How does inheritance promote code reusability?	*2*	*K1*	*CO2*
24. What is the significance of static data and member functions in C++?	*2*	*K1*	*CO2*
25. Explain the purpose of dynamic casting in C++.	*2*	*K2*	*CO3*
26. How does the concept of polymorphism enhance code flexibility and reusability in C++?	*2*	*K1*	*CO3*
27. What is function template specialization in C++?	*2*	*K1*	*CO4*
28. What is the use of STL algorithms?	*2*	*K1*	*CO4*
29. List some methods supported by threads.	*2*	*K1*	*CO5*
30. How does the Raspberry Pi works?	*2*	*K1*	*CO6*

PART - C (6 × 10 = 60 Marks)
Answer ALL Questions

31. a) Discuss how the insertion (<<) and extraction (>>) operators are overloaded in C++ to handle user-defined types. Provide a C++ program as an example. **OR**	*10*	*K2*	*CO1*

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

b) Demonstrate with C++ program for (i) Passing objects to functions. (ii) Returning objects.	*10*	*K2*	*CO1*

32. a) Discuss the basic structure of inheritance in C++. Write a C++ program that demonstrates single-level inheritance, explaining how data members and member functions are inherited from a base class to a derived class. | *10* | *K2* | *CO2*

OR

b) How can new functionality be added to a derived class in C++? Write a program to illustrate how additional methods and members can be defined in a derived class while reusing the functionality of the base class. | *10* | *K2* | *CO2*

33. a) Define pure virtual functions and explain their role in creating abstract base classes in C++. | *10* | *K2* | *CO3*

OR

b) Illustrate a base class Shape with a virtual function area(). Derive classes Circle, Rectangle, and Triangle, each implementing the area() function. Demonstrate polymorphism by creating an array of Shape pointers and calculating the area of each shape. | *10* | *K2* | *CO3*

34. a) Create a program that demonstrates both generic and specialized function templates. Implement a generic function add() to add two values and specialize it for std::string type to concatenate two strings. | *10* | *K3* | *CO4*

OR

b) Make use of Set and Map in STL. | *10* | *K3* | *CO4*

35. a) Write a CPP program to create a shared memory and synchronize the threads access. | *10* | *K3* | *CO5*

OR

b) Perform the following menu operations:
a. Create new thread. Each thread should be named as "MyThread<count>" count starts from 1 .
b. Show all threads – it should print all threads name
c. Delete thread – it should prompt for thread number – once user enter thread number – for example input is 3 , then if MyThread3 is running then it should delete that thread and show success message else it should show error "MyThread3 is not running." | *10* | *K3* | *CO5*

36. a) Develop a C++ program that reads the state of a push button connected to a GPIO pin and lights up an LED connected to another GPIO pin based on the button press (e.g., the LED turns on when the button is pressed). | *10* | *K3* | *CO6*

OR

b) Write a C++ program that uses the wiringPi library to blink an LED connected to a GPIO pin. Include comments explaining each step of the process. | *10* | *K3* | *CO6*

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create