



End Term (Odd) Semester Examination December 2024

Roll no.

Name of the Course and semester: B.Tech (CSE) 3rd / B.Tech (CSE Integrated) 7th

Name of the Paper: Object Oriented Programming with C++

Paper Code: TCS-307/IBTCS-307

Time: 3 hour

Maximum Marks: 100

Note:

- (i) All the questions are compulsory.
- (ii) Answer any two sub questions from a, b and c in each main question.
- (iii) Total marks for each question is 20 (twenty).
- (iv) Each sub-question carries 10 marks.

Q1.

(2X10=20 Marks)

- a. List and explain the features of object-oriented programming. (CO1)
- b. Write C++ program to reverse each word of input string. (CO1)

Sample input: I love my India

Output: I evol ym aidnI

- c. Discuss the namespace and its advantages. Create two namespaces, myspace1 and myspace2. Both namespaces have a void calculate(int) method. In myspace1, the calculate() method is calculating and showing the table of any provided number, while in myspace2, the calculate() method is calculating and showing the square of any provided number. A programmer wishes to use both versions of calculate() functions in the same program. Write a code to help the programmer such that he/she can be saved from any ambiguity. (CO1)

Q2.

(2X10=20 Marks)

- a. Explain the importance of static variables. Also write a program to count the number of objects created for a class. (CO2)
- b. Explain operator overloading and its limitations. Also design a class "date" with private data members day, month, and year. Overload the extraction (>>) and insertion (<<) operators to enable input and output of "date" objects. The overloaded << operator should display the date in the format "dd/mm/yyyy", while the overloaded >> operator should allow user input to initialize a "date" object. Write a program to demonstrate the input and output functionality of "date" objects using these overloaded operators. (CO3)
- c. Students are having various details like name, roll number, department, and university name. Create a class with proper setter and getter methods for each property such that data hiding should be maintained. Also provide a function findByDepartment(string) to find the total number of students who belong to the provided department. Also write a code to use this class for "n" number of students where n>=2. (CO2)

Sample:

Number of students: 3		
Input the details of first student:		
Name= Ravi	Name= Riya	Name= Anna
Roll No.= 5	Roll No.= 6	Roll No.= 1
Department= CSE	Department= ME	Department= CSE
University Name= GEHU	University Name= GEHU	University Name= GEHU
Provide name of department: CSE		
Total no. of students belong to CSE=2		

Q3.

(2X10=20 Marks)

- a. Assume that a bank maintains two kinds of accounts for customers, one called a savings account and the other a current account. The savings account provides compound interest and withdrawal facilities but



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not chequebook facilities. The current account provides a chequebook facility but no interest. Current account holders should also maintain a minimum balance, and if the balance falls below this level, a service charge is imposed. Create a class Account that stores the customer name, account number, and opening balance. From this, derive the classes Current and Saving to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks: (i) deposit an amount for a customer and update the balance (ii) display the account details (iii) compute and deposit interest (iv) withdraw amount for a customer after checking the balance and update the balance. (v) Check for the minimum balance (for current account holders), impose penalty, if necessary, and update the balance. (CO4)

- b. Diamond's problem is very common in multiple inheritances. Discuss this problem with the support of a neat and clean diagram and code. Also write a program to resolve it. (CO4)
- c. Discuss constructors and destructors with suitable codes. Also write a program where the child's class constructor calls the parent class constructor to initialize the parent's class attributes. (CO2, CO4)

Q4. (2X10=20 Marks)

- a. Discuss early and late binding. 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 two specific classes called triangle and rectangle from base shape. Add to the base class, a member function getData() to initialize base class data members and another member function displayArea() to compute and display the area of figures. Make displayArea() as a virtual function and redefine this function in the derived class to suit their requirements. Using these three classes, design a program that will accept dimensions of a triangle or a rectangle interactively and display the area. Note that, the two values given as input will be treated as lengths of two sides in the case of rectangles and as base and height in the case of triangle and used as follows:

$$\text{Area of rectangle} = x * y$$

$$\text{Area of triangle} = (0.5) * x * y$$

(CO5)

- b. Discuss the importance of abstract classes. Also Create a base class called calculateArea(Abstract class). Use this class to store float type values that could be used to compute the volume of figures. Derive three specific classes called cone, hemisphere and cylinder from the base class calculateArea. Add to the base class, a member function getdata() to initialize base class data members and another member function display volume() to compute and display the volume of figures. Make display volume() as a pure virtual function and redefine this function in the derived classes to suit their requirements. Using these four classes, design a program that will accept dimensions of a cone, cylinder and hemisphere interactively and display the volumes. Note that, the values given as input will be and used as follows:

$$\text{Volume of cone} = (1/3)\pi r^2 h$$

$$\text{Volume of hemisphere} = (2/3)\pi r^3$$

$$\text{Volume of cylinder} = \pi r^2 h$$

(CO5)

- c. Suppose you have a class with private instance variables and no member functions are there, then discuss the way to access these variables outside the class with suitable code. (CO2)

Q5. (2X10=20 Marks)

- a. Discuss the term exception and its consequences if not handled properly. Consider a voting system that verifies the age of any voter before casting the vote. If the age is <18, then it throws an exception "ageException". Create an "ageException" and write a program that allows this exception to occur and also handles it. (CO6)
- b. List the different file opening modes with their descriptions. Also write a program that searches any string in an existing file. (CO6)
- c. Discuss the different components of STL. Create a list with initial elements {20,5,25}. Insert 10 at the first and 60 at the last positions, respectively. Remove the first element and last element from the updated list. Sort the list and remove 25 from the list. Then reverse the list and use an iterator to show the contents. (CO6)