

Master in Multimedia Development Examination, 2024  
and

M. Tech IT (Courseware Engg.) Examination, 2024

(Second Semester)

Object Oriented Programming

Time: Three hours

Full Marks: 100

Answer any *five* questions by taking at least *two* questions from *each* group

**GROUP – A**

- 1) Implement a “ComplexNumber” class in C++. The class “ComplexNumber” contains two integers to represent the real and imaginary part of a complex number.

Write a suitable constructor.

Also, write appropriate methods to overload the following operators:

- (i) “=” operator
- (ii) “\*” operator for multiplying two complex numbers
- (iii) “==” operator for equality comparison
- (iv) “>” operator; a complex number “a+ib” is greater than “c+id” if “ $a^2+b^2$ ” is greater than “ $c^2+d^2$ ”.
- (v) “<<” operator for displaying complex object in “a+ib” form where ‘a’ is the real part and ‘b’ is the imaginary part of a complex number.

3+3+3+3+4+4

- 2) Consider a class “Fraction” that contains two integer data members. One data member stores the numerator and the other stores the denominator. Write methods or functions for the following:

- a) Define a suitable constructor.
- b) Getters and setters for private data members: getNumerator(), getDenominator(), setNumerator() and setDenominator()
- c) Display the fraction in “p/q” form where ‘p’ represents numerator and ‘q’ represents denominator.

Write a main method to do the following:

- (i) Create four (04) objects of “Fraction” class

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- (ii) Set their numerators and denominators, and
- (iii) Display these four (04) fractions.

$$2+(2+2+2+2)+4+(2+2+2)$$

- 3) Develop an abstract class “GeometricObject” which has two variables “colour” and “weight”. Define a constructor for setting the “colour” as “white” and the “weight” as 1.0 as default values.

Define functions getColour() and getWeight() to return the colour and weight values to the caller.

Define two pure virtual functions, findArea() and findCircumference().

Define one subclass of “GeometricObject” called “Circle” with an additional variable “radius”.

Override the functions findArea() and findCircumference() in the “Circle” class.

$$2+(2+2)+(1+1)+5+(3+4)$$

- 4) Answer the following questions:

- (i) How do you define a reference to an integer in C++? Suppose that  $x$  is a defined as a reference to  $y$ . Can I now make  $x$  a reference to another variable  $z$ ?
- (ii) When is a copy constructor invoked?
- (iii) What is the difference between a friend function and any other global function?
- (iv) Distinguish between macros and inline functions.
- (v) What is multiple inheritance? What is its syntax? Explain the problem of multiple occurrence of the same base class in the context of multiple inheritance.
- (vi) Suppose that a class  $X$  has a static integer data member  $i$ . Also assume that  $a, b, c$  are instances of  $X$ . Further suppose that a value of  $i$  is 0 at some point of time and then  $a.i, b.i, c.i$  are incremented in that order. Now, what are the values of  $a.i, b.i, c.i$  and  $X::i$ ? Explain.

$$(2+1)+3+3+3+(2+1+2)+3$$

### Group – B

- 5) Implement a class in Java for “Date” with three integer members for day, month and year

- a) There should be four constructors: (i) day, month and year are initialized to 01, 01, 1970; (ii) day is initialized to user specified value but month and year are initialized to 01, 1970; (iii) day, month are initialized to user specified value but

year is initialized to 1970; (iv) day, month and year are initialized to user defined values.

- b) Write member functions for (i) getting the next day, and (ii) printing a date object
- c) Write a “main” function to (i) create a date object; (ii) print the next date of the created date object.

Note: Do not consider leap years.

$$1+4 \times 2+(5+3)+(1+2)$$

6) Answer the following questions.

- a) Define a *Student* class in Java with three fields for name, roll\_no and an array of six integers to store marks. Define an appropriate constructor for the *Student* class.
- b) Define the following methods for the *Student* class
  - (i) Clone (copy) one *Student* object to another.
  - (ii) Test whether two *Student* objects contain identical name and roll\_no.
- c) Define a main method in the *Student* class in which you do the following.
  - (i) Create five instances of *Student* class.
  - (ii) Write these instances in a file named, “StudentInfo” as objects.
  - (iii) Read these objects from the same file where they were stored.

$$3+(3+4)+(2+4+4)$$

7) (a) Define a class “Number” in Java that contains three integer data members “part1” and “part2”, “quotient”.

Write the following methods:

- (i) Constructor that initializes “part1” and “part2” to user defined integers and “quotient” to zero.
- (ii) divide() method that divides “part1” by “part2” of a “Number” object and store that in “quotient”.

Create an exception class “DivisionByZero”. Add the code in the divide() method of the “Number” class to throw this exception.

Write a main method to:

- i) create a “Number” object
- ii) define a try-catch block to call divide() method on that object with suitable exception object.

(b) Write a Java program to read the input file name and the output file name from the command line. Define a copy method to copy the input file to the output file and display number of white spaces (blank, tab, newline) in the input file on the console.

$$1+(2+2) +3+(1+3) +(2+6)$$

8) Answer the following questions.

- (i) What is the base class in Java from which every class is derived? Mention (do not explain) three methods of that class.
- (ii) What is the default access specifier in Java? How is it different from “public” access specifier?
- (iii) Explain “final” modifier in Java.
- (iv) What is the purpose of “instanceof” keyword in Java?
- (v) In Java, what is an interface and how is it different from an abstract class?
- (vi) In Java, how can you convert an integer to a string and a string containing digits to an integer?
- (vii) What is an inner class in Java?

(1+3)+(1+2)+3+2+(1+2)+(2+2)+1