Master in Multimedia Development Examination, 2018
and
M. Tech IT (Courseware Engg.) Examination, 2018

(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) Write a class to represent complex numbers with necessary constructors. Write methods or functions for the following:
   a) Overloading the operator "+".
   b) Overloading the operator "*".
   c) Overload the operator "<<" so that a complex number is displayed in "a+ib" form.
   d) Overload ">" operator. A complex number "a+ib" is greater than "c+id" if "$a^2+b^2$" is greater than "$c^2+d^2$".

   4+4+4+4+4

2) Define a class *Point* in C++ that has two members indicating its x and y coordinates. The class *Point* must have appropriate constructors. Also, define a class *Rectangle* that contains an array of four *Point* objects. In the class *Rectangle*, define constructors and methods for (i) computing the perimeter of the rectangle and (ii) computing the area of the rectangle.
   Write a friend function *isInside(Rectangle r, Point p)* that tests whether the point "p" is inside the rectangle "r".

   5+10+5

3) Implement a class "Counter" with three pure virtual functions "increment", "decrement" and "display". Consider two classes "IntegerCounter" and "EnumerationCounter" which are derived from the class "Counter". "IntegerCounter" class contains an integer whose value is incremented or decremented or displayed. "EnumerationCounter" contains an array of strings. When an EnumerationCounter object is incremented (decremented) then its index in the array is increased (decreased) by one till the index reaches its maximum (minimum). If the index reaches maximum then an increment in the index will set the index to zero. If the index reaches zero then a decrement in the index will set the index to its maximum. Implement the classes "IntegerCounter" and "EnumerationCounter".

   4+6+10

4) Answer the following questions.

(i) How do you define a reference to an integer in C++? Is the following statement correct?

int &x = 10;

(ii) What is the syntax of a copy constructor? When is a copy constructor invoked?

(iii) When can a function call be used in the left hand side of an assignment operator?

(iv) What is the difference between a friend function and any other global function?

(v) How do you write an abstract class in C++?

(vi) Suppose that a class *X* has a static integer data member *i*. Also, assume that *obj1*, *obj2*, *obj3* are instances of *X*. Further suppose that the value of *i* is 0 at some point of time and then *obj1.i*, *obj2.i*, *obj3.i* are incremented in that order. Now, what are the values of *obj1.i*, *obj2.i obj3.i* and *X::i*?

(vii) What type of variables are *cin* and *cout*?

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

**Group – B**

5) Consider a base class "Vehicles" for representing various types of vehicles in JAVA. It stores number of wheels, speed and the colour of the vehicle. Create two derived classes "Truck" and "Car" that inherit from "Vehicles". The "Car" class also stores number of seats and the "Truck" class also stores the load limit. Write main() method to create objects of these classes and display all the information about "Car" and "Truck". Also, compare the speed of the two vehicles, "Car" and "Truck" and display "slower" or "faster" if Car is slower or faster than Truck.

20

6) Consider the following questions.

a) Write a JAVA program to read 50 integers and displays those numbers which are prime.

b) Mention three methods which are not in *String* class but in *StringBuffer* class. Why are these methods not defined in *String* class?

c) Consider an *Employee* class that contains the name, employee-id, department, and monthly salary of an employee. Define an appropriate constructor for the *Employee* class. Write a JAVA program to do the following.

i) Create five (05) instances of *Employee* class.

ii) Store these instances in a file named, "Human Resources" as objects.
iii) Read these objects from the same file in five *Employee* variables.

5+(3+2)+10

7) Create a simple Calculator application using SWING. The calculator has number buttons ('0' – '9'), operation buttons ('+', '-', '*', '/', '=' and 'C'), "Exit" button and a display area. When a user clicks on any number button or operation button except '=' and 'C', the displayed caption on the button will be displayed in the display area. If user clicks on '=' button, the result of the expression will be displayed in the display area. Clicking on 'C' button will clear the display area. Clicking on the "Exit" button will close the Calculator application.

8) Answer the following questions. 20

a) Explain *try*, *catch* and *finally* block with an example.

b) Explain, in brief, the event handling mechanism in the "SWING" package of Java programming language.

c) What is the base class of all the classes in JAVA? Mention three important methods of that class.

d) How can you create package in Java? What kind of classes can be grouped in a package? How your friend's code can use classes in your package?

e) What is an interface? Why is an interface used in Java? What are the marker interfaces? Give two examples of marker interface?

4x5