Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL

I SEMESTER (M.C.A)

END SEMESTER EXAMINATIONS, NOV/DEC 2017

SUBJECT: OBJECT ORIENTED PROGRAMMING & DESIGN

[MCA 4101]

REVISED CREDIT SYSTEM
(18/11/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL the questions.
- Missing data may be suitably assumed.

1A. Differentiate between virtual and pure virtual functions in inheritance of classes. Implement this concept using an appropriate example. Explain the significance of the base class pointer. 5

1B. Discuss the possibility of one friend function being a friend to more than one classes. If possible, give a simple example for this. 3

1C. With an example, differentiate between a reference variable and a pointer variable. 2

2A. Discuss the following building blocks of UML with suitable examples: Relationships (dependency, generalization and association) and things (structural and grouping). 5

2B. Explain the reason for the ambiguity seen in case of multiple path inheritance: B and C inherits publicly from A. Class D inherits publicly from B and C. What are the proposed solutions? Discuss. 3

2C. Differentiate between aggregation and composition in UML. 2

3A. Explain the hierarchy of stream classes with the help of a neat diagram. List at least three file opening modes for binary files. 5

Write a program that emulates the Linux cp command. That is, it should copy the contents of a text file (such as any .CPP file) to another file.

3B. Illustrate the use of constants in a program that accepts a two-dimensional matrix A of order WIDTH x LENGTH. Assume the existence of two constants WIDTH and LENGTH. Write a function with the following signature: 3

```
void transpose (const int A[][LENGTH], int B[][WIDTH]);
```

The function should transpose original matrix A, placing transposed matrix in B.

3C. List the differences between a C++ class and structure. Justify with an appropriate example. 2

4A. Explain the difference between overloading operators using operator member functions and friend operator functions. 5

Given a class called **"Number"** with an array n[5] as its data member. Member functions include: a parameterized constructor, get_ numbers to accept numbers from user. Write a C++ program to create the class members and perform the following operations:

1. Overload the '[]' bracket operator such it displays all the elements N[i] where 'N' is an object of Number and 'i' is the index
2. Overload the binary '+' to add two instances of Number N1 and N2 and displays the result in N2

4B. Explain data conversion between an object and basic data type. Implement this concept in a program to convert object of my_time class (with hours and mins as integer data members) and integer variable duration which accepts time in minutes. 3

Expected output: For duration=196, result is 3 hours and 16 minutes.

4C. Write a program to read a numerator and a denominator and evaluate the expression: result = numerator / denominator. Use exception handling to throw an exception in case division by zero is attempted. 2

5A. Write a program implementing function template for sorting an array of values in descending order. The inputs may be integers and characters. 5

Can we overload function templates? If yes, provide a suitable example.

5B. Model with a **class diagram** the following system: Vending Machine. A vending machine sells small, packaged, ready to eat items (chocolate bars, cookies, candies, etc.). Each item has a price and a name. A customer can buy an item, using a smart card (issued by the vending machine company) to pay for it. No other payment forms (i.e. cash, credit card) are allowed. The smart card records on it the amount of money available. The functions supported by the system are: 3

- Sell an item (choose from a list of items, pay item, distribute item)
- Recharge the machine
- Set up the machine (define items sold and price of items)
- Monitor the machine (number of items sold, number of items sold per type, total revenue)

The system can be used by a customer, a maintenance employee (who recharges items in the machines), and an administrator (who sets up the machine).

5C. Improve the model (question 5B) of the Vending Machine with a **sequence diagram** describing a successful sales procedure. 2