CONFIDENTIAL

Infrastructure University Kuala Lumpur

FINAL EXAMINATION
SEPTEMBER/OCTOBER SEMESTER 2015

BACHELOR OF INFORMATION TECHNOLOGY (HONS)
IN SOFTWARE ENGINEERING
BACHELOR OF INFORMATION TECHNOLOGY (HONS)
IN NETWORK TECHNOLOGY
BACHELOR OF COMPUTER SCIENCE (HONS)

ADVANCED PROGRAMMING
(BTT 112)

(TIME : 3 HOURS)

MATRIC NO. : | | | | | | | | | |

IC. / PASSPORT NO. : | | | | | | | | | | | | | | |

LECTURER : **NORADIBAH ADNAN**

GENERAL INSTRUCTIONS

1. This question booklet consists of 9 printed pages including this page.
2. **SECTION A**: Answer **ALL questions** in the **ANSWER BOOKLET**
3. **SECTION B**: Answer **ALL questions** in the **ANSWER BOOKLET**
4. **SECTION C**: Answer **ONE (1) question** in the **ANSWER BOOKLET**

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INSTRUCTIONS: **TIME: 3 *HOURS***

SECTION A **(40 MARKS)**

There are FOUR (4) questions in this section. Answer ALL Questions in the Answer Booklet.

1. Consider the following class prototype:

   The *AutoDealership* system is used to manage its inventory of used cars and to keeps the following data about each automobile: *Make, Year model, Mileage, Price.*

```
class Automobile
{
   private:
      string make;
      int model;
      int mileage;
      double price;
   public:
      Automobile();
      Automobile(string, int, int, double);
      string getMake() const;
      int getModel() const;
      int getMileage() const;
      double getPrice() const;
};
```

   Write a definition for default constructor and constructor.

   (9 marks)

2. Consider the class named `Car` that inherits from `Automobile` class (refer question 1). The class `Car` has all characteristics that the `Automobile` class have, plus its own specialized characteristics. For cars, the dealership keeps the following additional data: *Number of doors (2 or 4).*

   Answer the following:

   a) Write a constructor for `Car` class that inherits from `Automobile` class.

   (5 marks)

   b) Write an accessor for doors attribute of `Car` class.

   (2 marks)

3. Consider the following class prototype:

The `FCMIT` class is a subclass to `Student` class. The class is to calculate the number of remaining hours that need to be completed.

```
class FCMIT : public Student
{
   private:
      int uniHours;      // hours of university subjects taken
      int facHours;      // hours of faculty subjects taken
      int elHours;       // hours of elective subjects taken
   public:
      virtual int balanceHours()const;
      // ..... other functions
};
```

Answer the following:

a) The `Student` class has a pure virtual function named `balanceHours()`. Write the function declaration of `balanceHours()`.

(2 marks)

b) Write the overridden pure virtual function derived from the `Student` class. Following are the calculation for the remaining hours to be completed:

Balance hours = total of required hours to be completed – total of (university + faculty + elective) subjects taken

(6 marks)

c) Assuming the constructor of `Student` class is defined as follows :

```
Student::Student(string n, string id, int year)
{
  name = n;
  idStudent = id;
  yearAdmitted = year;
}
```

Declare an object to store the information of the following students:

Name: Julia
Student ID: 133912176
Year admitted: 2013
Hours of university subjects taken: 9
Hours of faculty subjects taken: 32
Hours of elective subjects taken: 12

(5 marks)

4. Consider the following classes:

```
class AAA
{    public:
        virtual void show() { cout << "AAA" << endl; }
};

class BBB : public AAA
{    public:
        void show() { AAA::show(); cout << "BBB" << endl; }
};
```

Answer the following:

a) Write object for both class `AAA` and `BBB`.

(2 marks)

b) Write a function named `display` that able to demonstrate polymorphism behavior. The function must receive pointer as a parameter.

(4 marks)

c) Write a function declaration for `display` function.

(2 marks)

d) Write statement to pass objects created in question 4(a) to function `display` created in question 4(b). When the function is called, the object shall be passed by reference.

(3 marks)

SECTION B **(30 MARKS)**

There are EIGHT (8) questions in this section. Answer ALL Questions in the Answer Booklet.

1. What is the output of the following:

```
class Calculate
{
    private:
        int x;
        static int y;
    public:
            static int countNum;
            void print() const
            {
                cout << "x = " << x << ", y = " << y
                     << ", count = " << countNum << endl;
            }

            void setX(int a) { x = a; }
            static void incrementY() { y++; }
            Calculate(int a = 0) { x = a; }
};
int Calculate::countNum = 0;
int Calculate::y = 0;

int main() {
    Calculate c1(2), c2(4);

    Calculate::incrementY();
    Calculate::countNum++;
    c1.print();
    c2.print();

    cout << endl;
    c1.incrementY();
    c1.setX(7);
    c1.print();
    c2.print();

    cout << endl;
    c2.setX(5);
    c2.print();

    return 0;
}
```

(5 marks)

2. What is the output by the following code segment?

```
char * const A = "EXAMINATION";
int i = 3;
char *p = A + i;
cout << p << endl;
p += 2;
cout << p << endl;
--p;
cout << p << endl;
```

(3 marks)

3. What is the output by the following code?

```
void change(int x, int &y, int *z) {
 x++;
 y++;
 (*z)++;
}

int main() {
  int i = 1, j = 1, k = 1;
  change(i, j, &k);
  cout << "i: " << i << endl;
  cout << "j: " << j << endl;
  cout << "k: " << k << endl;
 return 0;
}
```

(3 marks)

4. What is the output by the following code segment?

```
string c1("C++");
string c2("++C");

cout << c1 << endl << c2 << endl;
c2 = string(c1);
cout << c1 << endl << c2 << endl;
    return 0;
```

(4 marks)

5. What is the output by the following code?

```
int test() {
  try {  throw runtime_error("Exception in test()"); }
  catch(exception &ex) {
     cout << "Caught in test()" << endl;
     cout << ex.what() << endl;
     throw;
  }
}

int main() {
  try { test(); }
  catch(exception &ex) {
     cout << "caught in main()" << endl;
     cout << ex.what() << endl;
  }
 return 0;
}
```

(4 marks)

6. What is the output by the following code segment?

```
int a[] = { 3,3,3,3};

try {
   for(int x = 3; x >= 0; x--)
     if(x == 0)
       throw x;
     else
       cout << "x: " << a[x] / x << endl;
}
catch(int ex)
{  cout << "Exception when x is: " << ex << endl; }
```

(4 marks)

7. What is the output by the following code?

```
class Tank
{
    private:
        int gallons;
    public:
        Tank() { gallons = 50; }
        Tank(int gal) { gallons = gal; }
        int getGallons() { return gallons; }
};

int main()
{
    Tank storage[3] = { 10, 20 };
    for ( int x = 0; x < 3; x++ )
        cout << "Storage " << (x+1) << ": "
             <<  storage[x].getGallons() << endl;
    return 0;
}
```

(3 marks)

8. What is the output by the following code?

```
class Package
{
    private:
        int val;
    public:
        Package() { val = 7; cout << val << endl; }
        Package(int v) { val = v; cout << val << endl; }
        ~Package() { cout << val << endl; }
};

int main()
{
    Package o1(4);
    Package o2();
    Package o2(2);
    return 0;
}
```

(4 marks)

SECTION C **(30 MARKS)**

There are TWO (2) questions in this section. Answer ONE (1) question in the Answer Booklet.

1. Write a class template to identify a maximum value from two numbers. The class should have two member variables, constructor and accessor, and a member function named `compare` that will identify which number will return a maximum value.

(30 marks)

2. Write a class named `MathOperations` that able to perform the arithmetic operations. The program shall have a member variable of type integer, default constructor, constructor, accessor and the following overloaded operators:
   - division operator (`/`): this operator should modify the `MathOperations` object so that it able to return the result of division.
   - multiplication operator (`*`): this operator should modify the `MathOperations` object so that it able to return the result of multiplication.

(30 marks)

***** END OF QUESTIONS *****