a) What would be the output produced by executing the following C++ code? Identify errors, if any (Either write output or error , Both will not be acceptable). (6 marks)

```
1#include <iostream>
2 using namespace std;
3 class Number {
4 private:
5 int n;
6 public:
7 Number() : n(0) {
8 cout << n;
9 }
10
11 Number( int nn )
12 : n(nn)
13 {
14 cout << n;
15 }
16
17 Number(Number const& otherNum)
18 : n(otherNum.n+1)
19 {
20 cout << n;
21 }
22
23 void display() { cout << n; }
24 void increase() { n += 1; }
25 };
26 int main(){
27 Number a, b(1), c(b);
28 b.increase();
29 c.display();
30 b.display();
Return 0;
31 }
```

Output: 01222

Rubrics:

1 [1 marks]

2 [1 marks]

2 [2 marks]

2 [1 marks]

2 [1 marks]

b) What would be the output produced by executing the following C++ code? Identify errors, if any (Either write output or error, both will not be acceptable). (6 marks)

```
1 #include <iostream>
2 using namespace std;
3 class Test{
4 private:
5 int val;
6 public:
7 Test(const Test& _other) : val(_other.val + 1)
8 { }
9
10 Test(int _val) : val(_val) { }
11
12 int get_val() const{ return val;}
13
14 const Test& operator=(Test const& _other){
15 val = _other.val;
16 return *this;
17 }
18 Test operator+(Test const& _other){
19 Test t(val+ _other.val);
20 return t;
21 }
22 };
23
24 ostream& operator<<(ostream& stream, const Test & _val){
25 stream << _val.get_val();
26 return stream;
27 }
28
29 int main( ){
30 Test a(1), b(2),c(a+b);
31 a = b+c;
32 cout << a << " " << b<<" "<<c;
Return 0;
33 }
```

Output: 7 2 4

Rubrics:

7 [2 marks]
2 [2 marks]
4 [2 marks]

c) What would be the output produced by executing the following C++ code? Identify errors, if any (Either write output or error, both will not be acceptable). (6 marks)

```
1 #include <iostream>
2 using namespace std;
3 class Memory {
4 float capacity;
5 public:
6 Memory(int cap = 1) {
7 capacity = cap;
8 cout << " Added Memory of Capacity= "
9 << capacity << " G " << endl;
10 }
11 ~Memory() {
12 cout << " Removed Memory of Capacity= "
13 << capacity << " G " << endl;
14 }
15 };
16 class Core {
17 float speed;
18 public:
19 Core(float speed_ = 3.3) {
20 speed = speed_;
21 cout << " Added 1 Core of Speed= "
22 << speed << " GHz " << endl;
23 }
24~Core() {
25 cout << " Removed 1 Core of Speed= "
26 << speed << " GHz " << endl;
27 }
28 };
29 class Processor {
30 const int ncores;
31 Core cores[4];
32 public:
33 Processor() :
34 ncores(4) {
35 cout << " Added a Processor of "
36 << ncores << " Cores " << endl;
37 }
38~Processor() {
39 cout << " Removed a Processor of = "
40 << ncores << " cores " << endl;
41 }
42 };
43 class Mobile {
44 Memory m;
45 Processor p;
46 public:
47 Mobile() {
48 cout << " Building a Mobile " << endl;
49 }
50 ~Mobile() {
51 cout << " Destroying a Mobile " << endl;
52 }
53 };
```

```
54 int main() {
55 Mobile m;  cout << " :) The End " << endl; return 0; }
```

Output:

Added Memory of Capacity= 1 G
Added 1 Core of Speed= 3.3 GHz
Added 1 Core of Speed= 3.3 GHz
Added 1 Core of Speed= 3.3 GHz
Added 1 Core of Speed= 3.3 GHz
Added a Processor of 4 Cores
Building a Mobile
:) The End
Destroying a Mobile
Removed a Processor of = 4 cores
Removed 1 Core of Speed= 3.3 GHz
Removed 1 Core of Speed= 3.3 GHz
Removed 1 Core of Speed= 3.3 GHz
Removed 1 Core of Speed= 3.3 GHz
Removed Memory of Capacity= 1 G

Rubrics:

0.4 marks for each line (Zero marks for Incorrect order)

d) What would be the output produced by executing the following C++ code? Identify errors, if any (Either write output or error, both will not be acceptable). (6 marks)

```
1 #include <iostream>
2 #include<cassert>
3 using namespace std;
4 class Point3D
5 {
6 public:
7 Point3D() {
8 p[0] = p[1] = p[2] = 0;
9 }
10 Point3D(int x_, int y_, int z_) {
11 p[0] = x_; p[1] = y_; p[2] = z_;
12 }
```

```
13 Point3D operator*(const int & v) {
14 Point3D v1;
15 v1[0] = p[0] + v; v1[1] = p[1] + v; v1[2] = p[2] + v;
16 return v1;
17 }
18
19 Point3D operator+(const Point3D &v) {
20 Point3D v1;
21 v1[0] = p[0] + v[0]; v1[1] = p[1] + v[1]; v1[2] = p[2] + v[2];
22 return v1;
23 }
24
25 Point3D operator-(const Point3D &v) {
26 Point3D v1;
27 v1[0] = p[0] - v[0]; v1[1] = p[1] - v[1]; v1[2] = p[2] - v[2];
28 return v1;
29 }
30
31 Point3D operator-() {
32 Point3D v1;
33 v1[0] = -p[0]; v1[1] = -p[1]; v1[2] = -p[2];
34 return v1;
35 }
36 bool operator==(const Point3D &v) {
37 return p[0] == v[0] && p[1] == v[1] && p[2] == v[2];
38 }
39 int operator[](const int & i) const {
40 assert(i >= 0 && i <= 2); // check for index with-in range
41 return p[i];
42 }
43 int & operator[](const int & i) {
44 assert(i >= 0 && i <= 2); // check for index with-in range
45 return p[i];
46 }
47 private:
48 int p[3];
49 };
50 ostream &operator<<(ostream &out, const Point3D&v) {
51 out << " X = " << v[0] << " Y = " << v[1] << " Z = " << v[2]
<< endl
52 << flush;
53 return out;
54 }
55
56 int main() {
57 Point3D p1(10, 20, 30), p2(20, 30, 40);
58 cout << " P1 : " << p1 << " P2 : " << p2 << endl;
59
60 Point3D p3;
61 p3[0] = 5;
62 p3[1] = 5;
63 p3[2] = 5;
64
65 Point3D p4 = -p1 - p2 - p1 * !(p1 == p2);
66 cout << " P4 : " << p4 << endl; return 0; }
```

Output:

P1 : X = 10 Y = 20 Z = 30
P2 : X = 20 Y = 30 Z = 40

P4 : X = -41 Y = -71 Z = -101

Rubrics:

P1 [2 Marks] -> 1 mark will be given if one value is incorrect otherwise ZERO
P2 [2 Marks] -> 1 mark will be given if one value is incorrect otherwise ZERO
P4 [2 Marks] -> 1 mark will be given if one value is incorrect otherwise ZERO

e) What would be the output produced by executing the following C++ code? Identify errors, if any (Either write output or error, both will not be acceptable). (5 marks)

```
#include <iostream>
#include <cassert>
using namespace std;
class Number {
public:
static int n;
Number() {cout << n++<<endl; }

Number(int i) {n=i;cout << n<<endl;}
static void somefunc(){  n=5;}

Number(Number const& otherNum){  cout << n<<endl; }

 ~Number(){cout<<--n;}
 };

void fun(Number n){
     cout<<n.n<<endl;
     n.somefunc();
 }
 int Number::n=0;

 int main(){
 Number a, b(9), c(a);
 fun(b);

 return 0;
```

}

Output:

0
9
9
9
9
4321

Rubrics:

0 [0.5 marks]
9 [0.5 marks]
9 [0.5 marks]
9 [0.5 marks]
9 [0.5 marks]
4 [1 mark]
3 [0.5 Mark]
2 [0.5 Mark]
1 [0.5 Mark]

f) What would be the output produced by executing the following C++ code? Identify errors, if any (Either write output or error, both will not be acceptable). (6 marks)

```
#include <iostream>
using namespace std;
class Integer {

 private:  int *n;
```

```
public:
   Integer() : n(new int) { *n=5;}

   Integer( int nn ):n(new int){   *n=nn;     cout << *n<<" ";   }

   Integer(Integer const& otherNum): n(otherNum.n){  cout << *n<<" ";   *n+=4;       }

    void display() { cout << *n<<" "; }

    void increase() { *n += 1; }  };

int main(){

            Integer a, b(1), c(b);

            b.increase();

            c.display();

            b.display(); return 0; }
```

Output:

1 1 6 6

Rubrics:

2 marks for each output