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- Print your name and ID number on the Opscan form; be sure to code your ID number on the Opscan form. Code **Form A** on the Opscan.
- Choose the single best answer for each question — some answers may be partially correct. If you mark more than one answer, it will be counted wrong.
- Unless a question involves determining whether given C++ code is syntactically correct, assume that it is valid. The given code has been compiled and tested, except where there are deliberate errors. Unless a question specifically deals with compiler `#include` directives, you should assume the necessary header files have been included.
- Be careful to distinguish integer values from floating point (real) values (containing a decimal point). In questions/answers which require a distinction between integer and real values, integers will be represented without a decimal point, whereas real values will have a decimal point, [1704 (integer), 1704.0 (real)].
- The answers you mark on the Opscan form will be considered your official answers.
- When you have completed the test, sign the pledge at the bottom of this page and turn in the test.
- This is a closed-book, closed-notes examination. No calculators or other electronic devices may be used during this examination. You may not discuss (in any form: written, verbal or electronic) the content of this examination with any student who has not taken it. You must return this test form when you complete the examination. Failure to adhere to any of these restrictions is an Honor Code violation.
- There are 25 questions, equally weighted. The maximum score on this test is 100 points.

Do not start the test until instructed to do so!

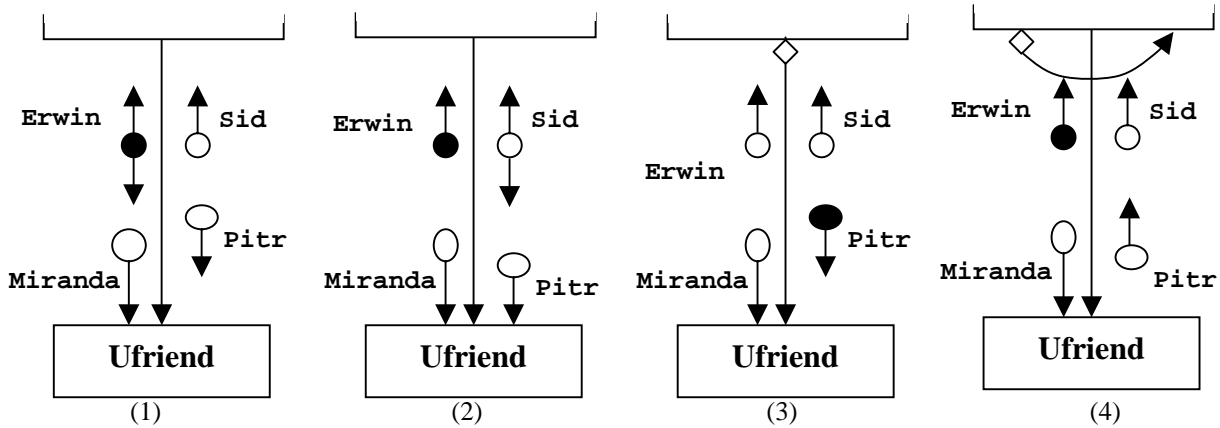
Print Name (Last, First) _____

Pledge: On my honor, I have neither given nor received unauthorized aid on this examination.

signature

I. Design Representation

Use the following partial Structure Chart diagrams below as answers for the next 2 questions:



Do not make any assumption about variables that are not shown on the chart. Given the following variable definitions:

```
bool Erwin, Sid, Greg;
int Pitr, Miranda;
```

#1 Which of the above structure chart diagrams for Ufriend() correctly models the code segment below?

```
if (Greg)
    Ufriend(Erwin, Sid, Miranda, Pitr);

void Ufriend(bool& Erwin, bool& Sid,
             int Miranda, int Pitr) {
    while (Pitr > 0)
        //code under control of while
```

#2 Which of the above structure chart diagrams for Ufriend() correctly models the code segment below?

```
Ufriend (Erwin, Sid, Miranda, Pitr);
if (Erwin)
    //code under control of if

void Ufriend(bool& Erwin, bool& Sid,
             int Miranda, int Pitr) {
    while (Erwin)
        //code under control of while
```


#11 What value is printed by the code fragment below?

```
const int SIZE = 5;
int* x; int* y; int i;

x = new int[SIZE]; // assume allocation starts at address 00002000

for (i = 0; i < SIZE; i++)
    x[i] = i;
y = x + 1;
cout << " y = " << &y << endl;
```

- (1) 1 (2) 00002001 (3) 00002004
- (4) 4 (5) 00002008 (6) None of the above

Consider the following code:

<pre>void GetMem (int* const arr, int size, int init); const int SIZE = 10; void main() { int* a; GetMem(a, SIZE, -1); for (int i =0; i < SIZE; i++) cout << a[i] << " "; delete [SIZE] a; }</pre>	<pre>//allocate array memory & initialize void GetMem(int* const arr, int size, int init) { arr = new int[size]; //get new array for (int* i=&(arr[0]); size>0; i++, size--) *i = init; //initialize return; }</pre>
---	--

#12 In the code above, how is the array int pointer variable a being passed to the GetMem () function?

- (1) by value (2) by reference (3) by const reference
- (4) as a const pointer (5) as a pointer to a const target (6) as a const pointer to a const target
- (7) none of the above

#13 Unfortunately the above call to GetMem () may not function as intended. Select the statement below that best describes how to fix the problem.

- (1) the size parameter must not be decremented and used for loop control termination, a temporary local variable should be defined and used for this purpose.
- (2) the -1 parameter must not be passed as the init parameter to prevent it from being corrupted when the init parameter is decremented.
- (3) the integer pointer parameter, a, must be passed as a pointer to a constant target to prevent the for loop in GetMem () from accidentally resetting the array dimension when size is decremented.
- (4) the integer pointer parameter, a, must be passed as a reference array parameter to allow the changes made by GetMem () to be performed and prevent an illegal assignment occurring when the function is compiled.
- (5) none of the above (GetMem () does function as intended)

III. Class Basics

Assume the following class declaration and implementation:

```
class GasTank {
private:
    bool    cap;    //true = cap closed
    float  gals;   //number of gallons
public:
    GasTank();
    GasTank(bool lid, float level);
    void  OpenCap ();
    void  CloseCap();
    float Capacity();
    void  Pump (float amount);
    void  Siphon(float amount);
    ~GasTank();
};

GasTank:: GasTank () {
    cap = true;
    gals = 0.0F;
}

GasTank:: GasTank (bool lid,
                    float level){
    cap = lid;
    gals = level;
}

GasTank:: ~GasTank () { }
```

```
void GasTank:: OpenCap() {
    cap = false;
}

void GasTank:: CloseCap() {
    cap = true;
}

float GasTank:: Capacity () {
    return( gals );
}

void GasTank:: Pump (float amount) {
    OpenCap();
    gals += amount;
    CloseCap();
}

void GasTank:: Siphon (float amount) {
    OpenCap();
    gals -= amount;
    CloseCap();
}
```

Circle the number of the best answer to each question:

#20 Given the main function at the right, how many functions (not counting main itself), would be executed by the code?

- (1) 1 (2) 2 (3) 3 (4) 4
(5) 5 (6) 6 (6) None of the above

```
void main( ) {
    GasTank FuelTank;

    FuelTank.Pump(20.0F);
} //end main()
```

#21 Given that a bool variable is stored in 1 byte and a float variable is stored in 4 bytes, how many bytes of dynamic memory is allocated by the code in main() in the previous problem? (Count carefully.)

- (1) 0 (2) 2 (3) 9 (4) 13
(5) 5 (6) 15 (7) None of the above

#22 How many of the member functions in the GasTank class should have been declared as const member functions?:

- (1) 1 (2) 2 (3) 3 (4) 4
(5) 5 (6) 6 (7) 7 (8) 0

#23 How many constructor members does the GasTank class declaration contain?

- (1) 1 (2) 2 (3) 3
(4) 4 (5) 0 (6) None of the above

#24 What do the statements at the right accomplish:

```
void main( ) {  
    GasTank CarTank(true, 20.0F);  
    CarTank.Siphon(20.0F);  
} //end main()
```

- (1) instructs the GasTank object CarTank to fully empty its tank.
(2) instructs the GasTank object CarTank to open its cap and discharge 20.0 gallons.
(3) instructs the GasTank object CarTank to close its cap and add 20.0 to its gallons.
(4) instructs the CarTank object GasTank to fully empty its tank.
(5) instructs the CarTank object GasTank to open its cap and discharge 20.0 gallons.
(6) instructs the CarTank object GasTank to close its cap and add 20.0 to its gallons.
(7) the statements contains a syntax error
(8) None of these

#25 What do the following statements accomplish:

```
bool EmptyWarning (GasTank tank); //prototype  
  
// in main ()  
GasTank CycleTank(true, 3.0F); //Line 1  
if (EmptyWarning(CycleTank) ) //Line 2  
    cout << "***Fuel Low***";  
  
//Function Definition  
bool EmptyWarning (const GasTank& tank) { //Line 3  
    return( tank.gals <= 3.0F ); //Line 4  
}
```

- (1) causes the CycleTank object to display a warning message
(2) causes the GasTank object to display a warning message
(3) generates a compiler error message on line 1 (4) generates a compiler error message on line 2
(5) generates a compiler error message on line 3 (6) generates a compiler error message on line 4
(7) None of these