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Midterm Exam

CS120: High-Level Programming I - The C Programming Language

94/100

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Instructions

This exam will be graded against **100 points total** with **10 bonus points** in this paper. Excess points will not carry forward to your module total. Do **write legibly** and **show all workings** to derive at answers (for problems involving computation). Do assist with grading by **marking "//"** at your final answer to the question for problems involving computation.

1. **Write the correct single-line expression that matches the statement. You may assume integer variables "A" and "B" to be properly declared. [20 Marks]**

Statement	Expression
Example: Add B to A (A is modified)	A += B
Multiply A with B, result to be temporary	A * B ✓
Find the remainder of A divide by B, result to be temporary	A % B ✓
True if A is strictly greater than 0 and strictly lesser than 10 False otherwise	(0 < A < 10) ? 1 : 0 ✗ -2 (0<A)&&(A<10)
Bitwise-XOR of A and B, result to be temporary	A ^ B ✓
Shift bits of A to the left by 3 places, result to be temporary	A << 3 ✓
Get the address of A	&A ✓
Return 10 if A is equal to B, otherwise return 5	(A == B) ? ~~return~~ 10 : ~~return~~ 5 ✓
Assign 10 to A (A is modified, result discarded) Then, assign 5 to B (B is modified)	A = 10 , B = 5 ✓
Add A with 5 in a temporary value, then multiply that value by 10, result to be temporary	(A+5)*10 ✓
The number of bytes A uses in memory	4 ✗ -2 sizeof (A)

-4

2. Choose the correct option for the statements given. [20 Marks]

Statement	Answer
Example: An int variable takes up **(1/2/4/8)** bytes	4
In a 64-bit system, an `int*` variable takes up **(1/2/4/8)** bytes	8 ✓
In a 64-bit system, an `int**` variable takes up **(2/4/8/16)** bytes	8 ✓
You must have default and breaks inside a switch statement **(T/F)**	F ✓
Given expressions A and B used in statement `( A || B )` If A is evaluated to be true, then B will not be evaluated **(T/F)**	T ✓
The sizeof operator can be used to count the number of nodes in a linked list data structure **(T/F)**	F ✓
Given in a 64-bit system... `int A[10];` `sizeof(A)` will return a result of **(4/8/10/40)**	40 ✓
Following the previous question... `void Foo(int Input[]) { sizeof(Input); }` `Foo(A);` Foo's sizeof(Input) will return a result of **(4/8/10/40)**	8 40 X -2
All input arguments to functions are copied **(T/F)**	T ✓
If you pass a non-const pointer into a function, you may use the pointer to access & modify variables outside the scope of the function **(T/F)**	T ✓
It is compulsory to have all 3 parts of a for loop statement **(T/F)**	F ✓

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3. Read the following code snippets and write the expected outputs in the answer boxes that follow. You may assume that all necessary includes are present. [30 Marks x 2]

Code

```
int i, j;
for (i = 0; i < 5; ++i)
{
    for (j = i; j < 5; ++j)
    {
        if (j % 2)
            printf("#");
        else
            printf("*");
    }
    printf("\n");
}
```

Answer:

##*\n
#*#*\n
**#*\n
#*\n
*\n

Code

```
int a[10] = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9};
int* ptr[10]; int** pPtr[10]; int i;

for (i = 0; i < 10; ++i)
{
    ptr[i] = &a[(i*3)%10];
    pPtr[i] = &ptr[(i*7)%10];
}

printf("a[i]= ");
for (i = 0; i < 10; ++i)
    printf("%d ", a[i]);
printf("\nptr[i]= ");
for (i = 0; i < 10; ++i)
    printf("%d ", *ptr[i]);
printf("\npPtr[i]= ");
for (i = 0; i < 10; ++i)
    printf("%d ", **pPtr[i]);
```

&a[0]

ptr[0] = &a[(0*3)%10] = 0
[1] = &a[(1*3)%10] = 3
[2] = [(2*3)%10] = 6
[3] = [(3*3)%10] = 9
[4] = [(4*3)%10] = 2
[5] = [(5*3)%10] = 5
[6] = [(6*3)%10] = 8
[7] = [(7*3)%10] = 1
[8] = [(8*3)%10] = 4
[9] = [(9*3)%10] = 7

pPtr[0] = &ptr[(0*7)%10] = 0
[1] = [(1*7)%10] = 7
[2] = [(2*7)%10] = 4
[3] = [(3*7)%10] = 1
[4] = [(4*7)%10] = 8
[5] = [(5*7)%10] = 5
[6] = [(6*7)%10] = 2
[7] = [(7*7)%10] = 9
[8] = [(8*7)%10] = 6
[9] = [(9*7)%10] = 3

Answer:

a[i] = ␣0␣1␣2␣3␣4␣5␣6␣7␣8␣9␣\n
ptr[i] = ␣0␣3␣6␣9␣2␣5␣8␣1␣4␣7␣\n
pPtr[i] = ␣0␣7␣4␣1␣8␣5␣2␣9␣6␣3␣

0 1 2 3 4 5 6 7 8 9

X -10

-10

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4. Bonus: Read the following code snippet and write the expected output in the answer box. You may assume that all necessary includes are present. [10 Marks]

Code

```
int i = 0;
int a[5] = {0, 1, 2, 3, 4};
int *ptr1, *ptr2;
ptr1 = &a[0]; ptr2 = &a[4];

for (i = 0; i < 5; ++i)
{
    *ptr1 += i;
    *ptr2 += i;
    printf("%d, %d\n", *(ptr1+(i%5)), *(ptr2-(i%5)));
}
```

Answer:

0, 4
1, 3
2, 2
3, 1
14, 10

——— End of Exam ———