



MID-TERM TEST – 2018

TRIMESTER 1

NWEN241

SYSTEMS PROGRAMMING

ANSWER KEY FOR SET A

The others sets (B, C, and D) contain the same questions arranged in different orders.

SECTION A – True or False [10 marks]

Write True or False in the space provided. Each correct answer will garner 1 mark.

- 1) False int, main and void are C reserved keywords.
- 2) False In the statement `int i = 3.5 % 2;` the variable `i` will be assigned the value of 1 because the decimal part is discarded.
- 3) True The floating type `double` uses more space than `float`.
- 4) True `_variable$2` is an invalid C identifier.
- 5) False In the assembly phase, the compiler translates a pre-processed C source code into an assembly file (contains assembly language program).
- 6) False In the statement `int c = 'A'++;` the variable `c` will have a value of 66 which is the numeric value of the character 'B'.
- 7) True The expression `3 + 5 * 2 % 3 - 8 / 2 && 10` evaluates to 0.
- 8) True In evaluating the expression `a || b`, the evaluation is “short-circuited” when `a` is either positive or negative.
- 9) False Consider the following code fragment:

```
int a = 2, b = 1, n = 0, z = 3;  
if (n > 0) if (a > b) z = a; else z = b;  
printf("%d", z);
```

The output of the program would be 1.
- 10) True The expression `3 && 17 ? 17 / 3 : 17 % 3` evaluates to 5.

SECTION B – Multiple Choice [20 marks]

Write the letter that corresponds to the best answer in the space provided. Each correct answer will garner 2 marks.

1) Which of the following is an incorrect assignment statement?

- (a) `n = m = 0;`
- (b) `value += 10;`
- (c) `mySize = x < y ? 9 : 11;`
- (d) `testVal = (x > 5 || x < 0);`
- (e) none of the above

e

2) What is the output of the following code fragment?

```
char str[] = "Hello XYZ\t123\n";
int sum = 0, i = 0;
while(str[i])
    if(isdigit(str[i++]))
        sum++;
printf("%d", sum);
```

- (a) 123
- (b) 0000000000123
- (c) 2
- (d) 3
- (e) 00000000000123

d

3) Consider the following code fragment:

```
int i = 4, j = 0;
while(i) { --i && j++; }
```

What is the value of the variable `j` after the completion of the while-loop?

- (a) 0
- (b) 1
- (c) 2
- (d) 3
- (e) 4

d

- 4) Which of the following will read a character from keyboard and store it in a character variable c?
- (a) `gets(c);`
 - (b) `c = getchar();`
 - (c) `c = getc();`
 - (d) `getchar(&c);`
 - (e) `c = getchar(stdin);`

b

- 5) Suppose that the following are defined:
- ```
#define N 10/3
#define MSG "Hello"
```

Which of the following statements regarding arrays is invalid?

- (a) `int arr1[N] = {N};`
- (b) `char arr2[10] = MSG;`
- (c) `float arr3[N-3];`
- (d) `double arr4[] = {};`
- (e) none of the above

e

- 6) Which of the following is a valid C identifier?
- (a) `1node`
  - (b) `$value`
  - (c) `static`
  - (d) `first-last-name`
  - (e) none of the above

e

- 7) [Incorrectly marked, will be taken out from total score. Total score is now 73 instead of 75].

Consider the following function-like macro:

```
#define SOLVE_IT(X, Y) X * Y + X / Y
```

To what value does the macro evaluate to when invoked as  
SOLVE\_IT(2 + 6, (4 - 2))?

- (a) 20
- (b) 15
- (c) 18
- (d) 19
- (e) none of the above

- 8) Consider the following statement:

```
char string[12] = "Twelve ";
```

What is `strlen(string)`?

- (a) 12
- (b) 6
- (c) 7
- (d) 8
- (e) none of the above

- 9) Consider the following code fragment:

```
int n[10] = {1, 2, 3, 4, 5, 6, 7, 8, 9};
int *p = n + *n;
```

What is the value of `p[*p]`?

- (a) 2
- (b) 3
- (c) 4
- (d) 5
- (e) 6

- 10) What value is assigned to  $j$  in the expression  $j = ++i \% i - 2$  when  $i = 3$ ?
- (a) 0
  - (b) 1
  - (c) -1
  - (d) -2
  - (e) none of the above

d

**SECTION C – Open-Ended [45 marks]**

Write your answer in the space provided. Each correct answer will garner 3 marks.

- 1) If `c` is a variable of type `char`, what does the following statement do? Briefly explain your answer.

```
c = c + 'A' - 'a';
```

Converts a single, lower-case ASCII character stored in `c` to a capital letter, making use of the fact that corresponding ASCII letters are a fixed distance apart.

- 2) What is the output of the following program?

```
#define GOOD "Good"
#define BOY "Boy"
int main(void)
{
 int a = 5;
 a = printf("%.3s", GOOD)+ printf("%3s", BOY);
 printf("%d", a);
 return 0;
}
```

GooBoy6

- 3) Rewrite the following code using a while-loop.

```
int main(void)
{
 for(int i = 1; i <= 10; i++)
 printf("%d ", i);
 return 0;
}
```

```

int main(void)
{
 int i = 1;
 while(i <= 10 /* or i < 11 */) {
 printf("%d ", i); i++;
 }
 return 0;
}

```

4) What is the difference between the following statements?

```

char str1[] = "I am a string.\n";
char *str2 = "I am a string.\n";

```

str1 is an array of characters that contains a string variable.  
str2 is a pointer to a string literal or constant.

Or

The first string is stored as a string variable while the second string is stored as a string literal or constant.

5) The following code snippet uses a for-loop to increment each element of an array A[] containing m short integer elements. Rewrite the code to use pointers instead of array indexing to accomplish the same task.

```

int k;
for(k = 0; k < m; k++)
 A[k]++;

```

```

int k;
for(k = 0; k < m; k++)
 (*(A+k))++;

```

Or

```

for(short *pj = A; pj < A + m; pj++)
 (*pj)++;

```



- 6) What value will this function return if the parameters passed are 18 and 48, respectively?

```
int secret_function(int a, int b)
{
 while (b != 0) {
 int temp = a % b; a = b; b = temp;
 }
 return a;
}
```

6

(The secret\_function returns the greatest common divisor of a and b.)

- 7) A C implementation of the bubble sort algorithm is shown below:

```
void bsort(int list[], int len)
{
 for(int i = 0; i < len - 1; i++) {
 for(int j = 0; j < len - i - 1; j++){
 if(list[j] < list[j+1]){
 int temp = list[j+1];
 list[j+1] = list[j];
 list[j] = temp;
 }
 }
 }
}
```

If the array that is passed contains { 1, 10, 5, 8, 3, 2, 9, 7 }, what is the element in the 8<sup>th</sup> position (index of 7) after the first pass (completion of the inner loop for the first time)?

1

(The smallest value will be bubbled down to the last position.)

- 8) Declare a pointer to a function that accepts three pointers to integer quantities as arguments and returns a pointer to a floating-point quantity.

```
float *(*funcptr)(int *, int *, int *);

or

float *(*funcptr)(int *a, int *b, int *c);

(funcptr, a, b and c can be any valid C identifier)
```

- 9) Write a do-while loop that will calculate the sum of every third integer, beginning with i=1 (i.e., calculate the sum 1 + 4 + 7 + 10 + ...) for all values of i that are less than or equal to 200.

```
int sum = 0;
int term = 1;
do {
 sum += term;
 term += 3;
} while(term <= 200);
```

- 10) A C program has the following declaration:

```
int numbers[] = { 1, 0, 5, 8, 3, 4, 2, 7, 9 };
```

What is the value of `*(numbers + *numbers + 4)`?

4

- 11) What is the output of the following code fragment:

```
char string[] = "One\0Two\0Three\0Four";
char *str = &string[8];
printf("%s", ++str);
```

hree

12) Convert the following function into a function-like macro named MY\_MACRO:

```
int macro_me(int a, int b)
{
 int p = ++a;
 int q = b--;
 return p * p - q * q;
}
```

Ensure that the parameters passed remain the same after every invocation of the macro. Also ensure that the macro will work even when the parameters passed involve expressions with multiple operands.

```
#define MY_MACRO (((p)+1)*((p)+1)-(q)*(q))
```

13) What is the output of the following code fragment:

```
char string[] = "One\0Two\0Three\0Four";
printf("%d", strlen(string));
```

3

14) A C program has the following statements.

```
short i, j = 15;
short *pi, *pj = &j;
*pj = j + 5;
i = *pj + 5;
pi = pj;
*pi = i + j;
```

Suppose each short integer quantity occupies 2 bytes of memory. If the variable *i* is at (decimal) address 1608 and the variable *j* is at (decimal) address 1610, then [1 mark each]:

(a) What value is represented by *&j*?

1610

(b) What final value is assigned to \*pi?

|    |
|----|
| 45 |
|----|

(c) What value is represented by the expression (\*pi + 2)? [After the last statement.]

|    |
|----|
| 47 |
|----|

15) What is the output generated by the fourth line of the following code fragment if the user types in

Me loves C programming so much!  
and Enter into the keyboard?

```
char str[8];
printf("Say something: ");
scanf("%7s", str);
printf("%s\n", str);
```

|    |
|----|
| Me |
|----|

\*\*\*\*\*