TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI

VICTORIA
UNIVERSITY OF WELLINGTON

MID-TERM TEST – 2018 (A)

TRIMESTER 1

NWEN241

SYSTEMS PROGRAMMING

Time allowed: 45 MINUTES

CLOSED BOOK

Permitted materials: No calculators are allowed.

No electronic dictionaries are allowed.

Paper foreign to English language dictionaries are allowed.

Instructions: Attempt ALL THIRTY-FIVE (35) questions.

There are THREE sections:
- SECTION A – True or False
- SECTION B – MCQ
- SECTION D – Short Answer

Space for working out your solutions is provided at the end of every section.

Section	No of questions	Marks per question	Total marks	Obtained marks
A	10	1	10	
B	10	2	20	
C	15	3	45	
Total			75	

SECTION A – True or False [10 marks]

Read each statement carefully. In the space provided, write True if you think the statement is true, or False if you think the statement is false. Each correct answer will garner 1 mark.

1) _____   `int`, `main` and `void` are C reserved keywords.

2) _____   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) _____   The floating type `double` uses more space than `float`.

4) _____   `_variable$2` is an invalid C identifier.

5) _____   In the assembly phase, the compiler translates a pre-processed C source code into an assembly file (contains assembly language program).

6) _____   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) _____   The expression `3 + 5 * 2 % 3 – 8 / 2 && 10` evaluates to 0.

8) _____   In evaluating the expression `a || b`, the evaluation is "short-circuited" when a is either positive or negative.

9) _____   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) _____   The expression `3 && 17 ? 17 / 3 : 17 % 3` evaluates to 5.

Space for working out your solutions:
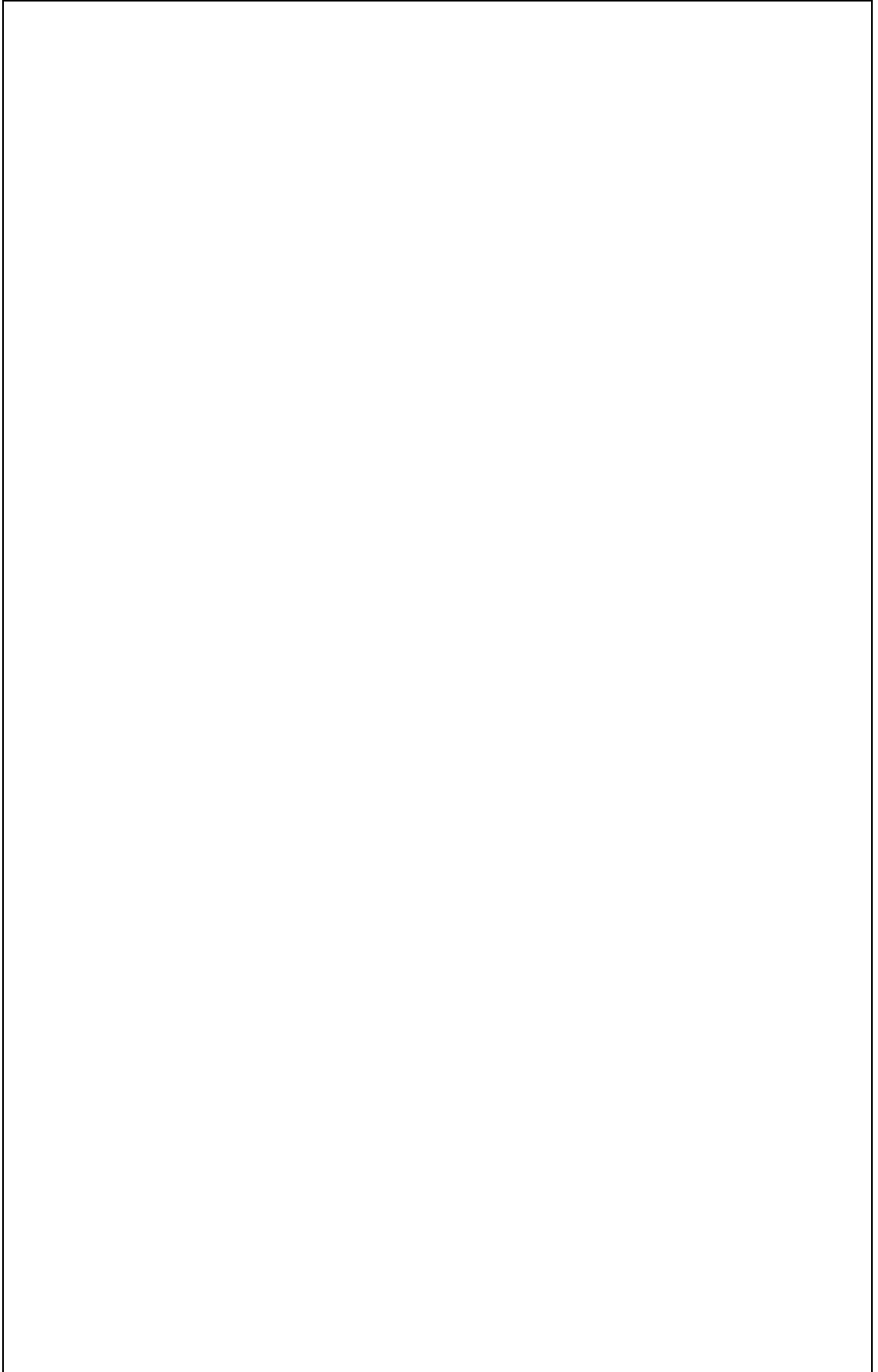
SECTION B – Multiple Choice [20 marks]

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

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`

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`

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);`

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

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

7) 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;
```
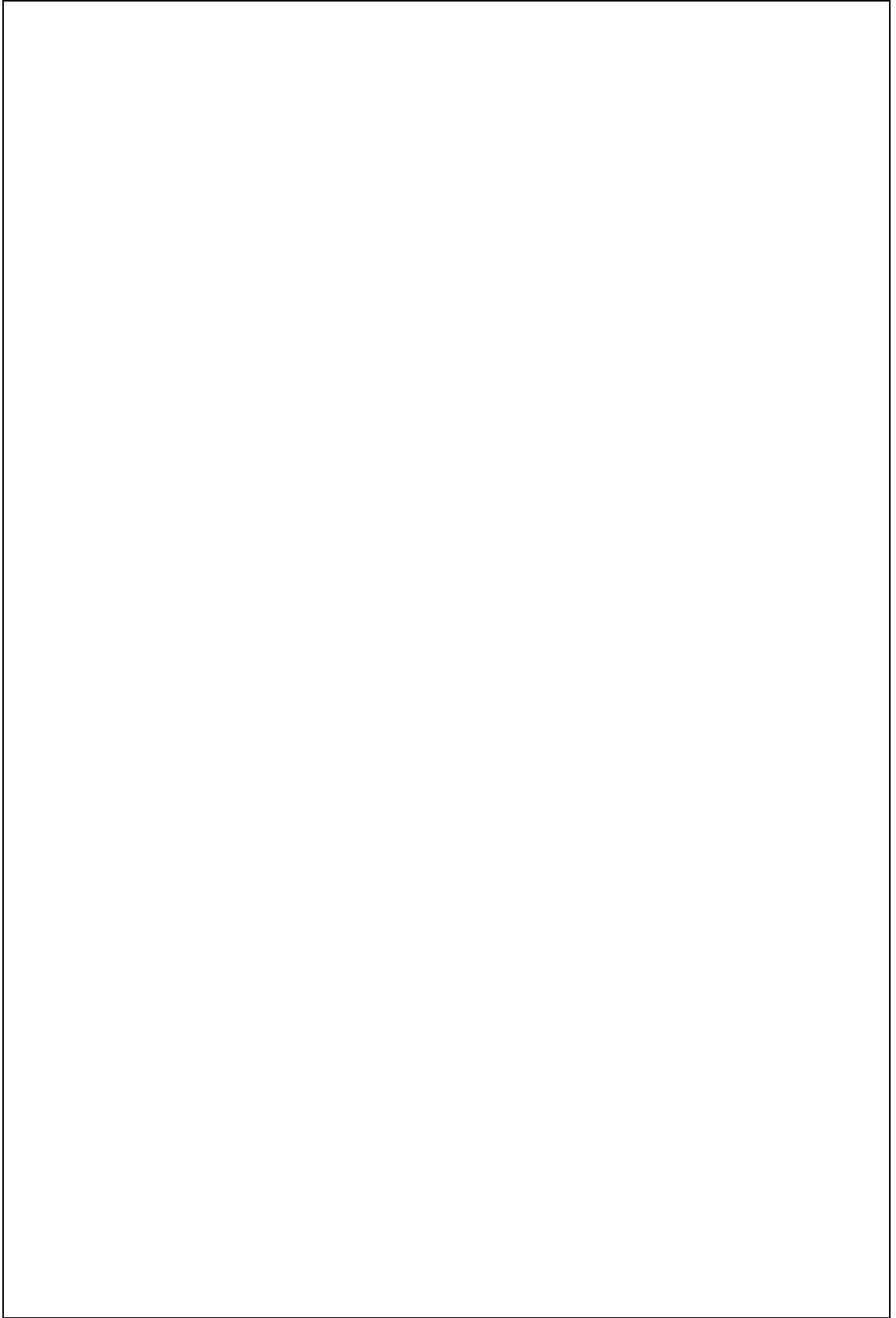
What is the value of `p[*p]`?
   (a) 2
   (b) 3
   (c) 4
   (d) 5
   (e) 6

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

Space for working out your solutions:

SECTION C – Short Answer [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 that contains a letter, what does the following statement do? Briefly explain your answer.

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

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;
}
```

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

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

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]++;
```

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

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

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

```c
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 list[7] after the first pass (completion of the inner loop for the first time)?

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.

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.

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)`?

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

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

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.

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

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

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

(a) What value is represented by &j?

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

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

15) What is the output generated by the fourth line of the following code fragment if the user types in
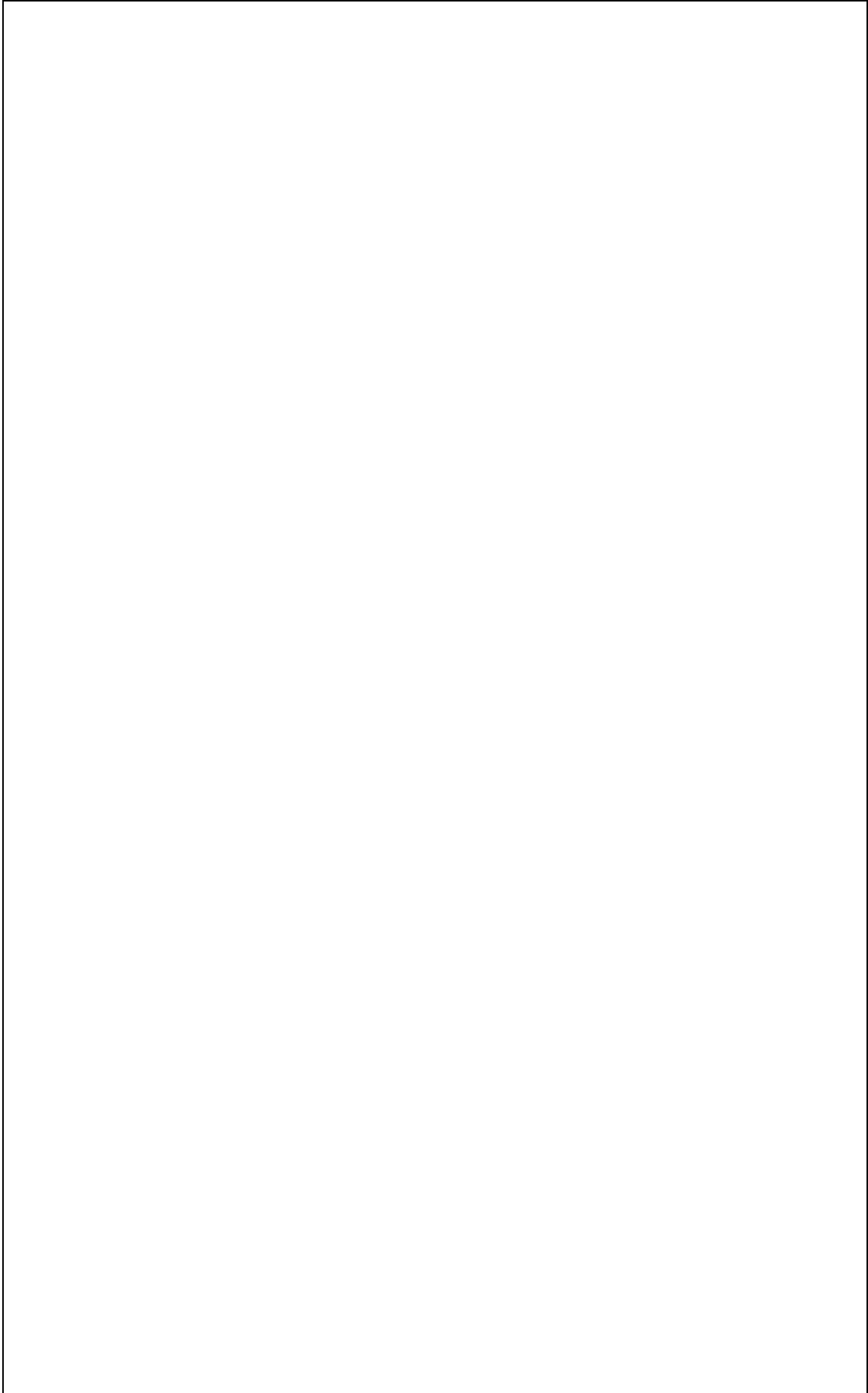
Me loves C programming so much!
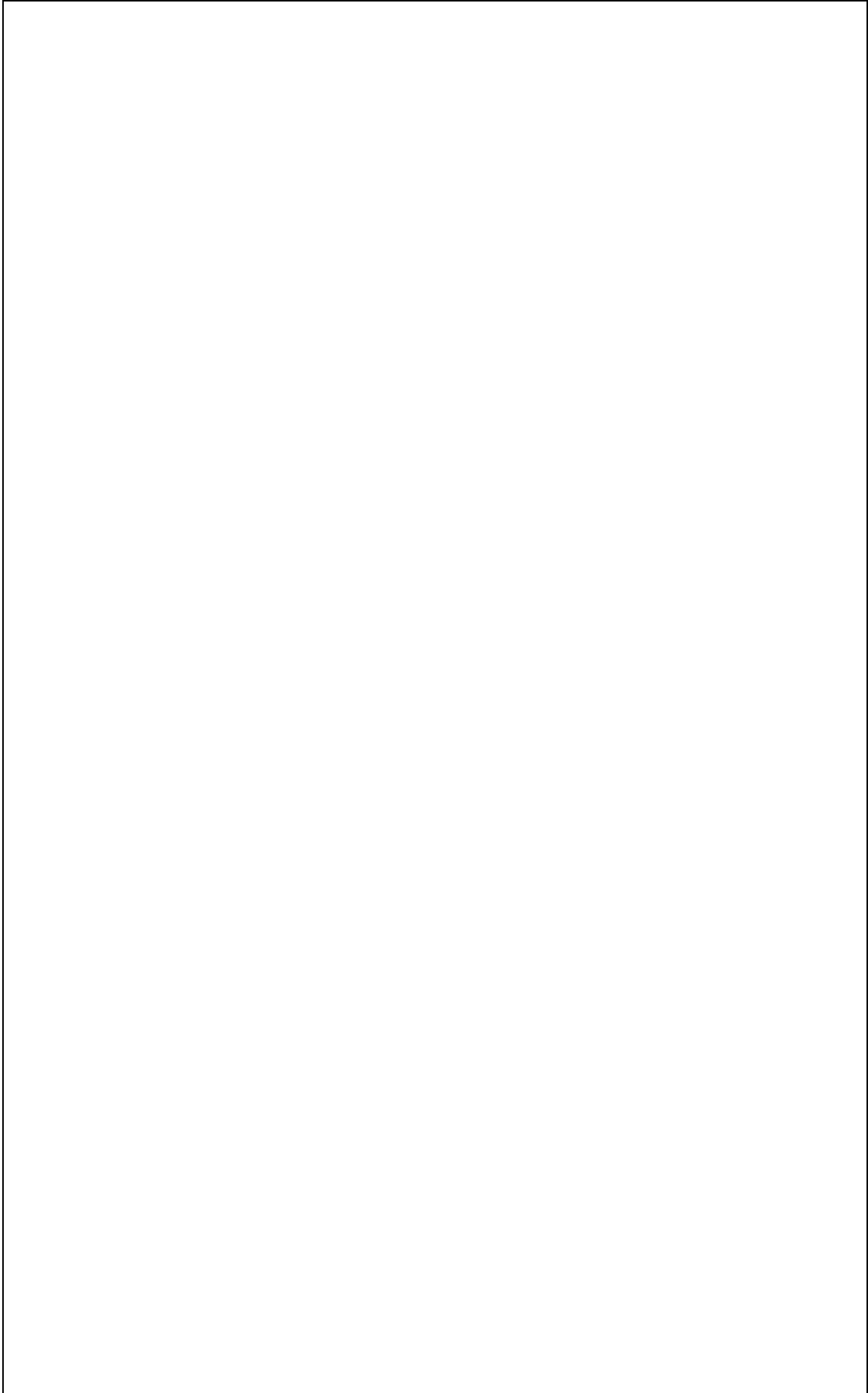
and Enter into the keyboard?

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

Space for working out your solutions:

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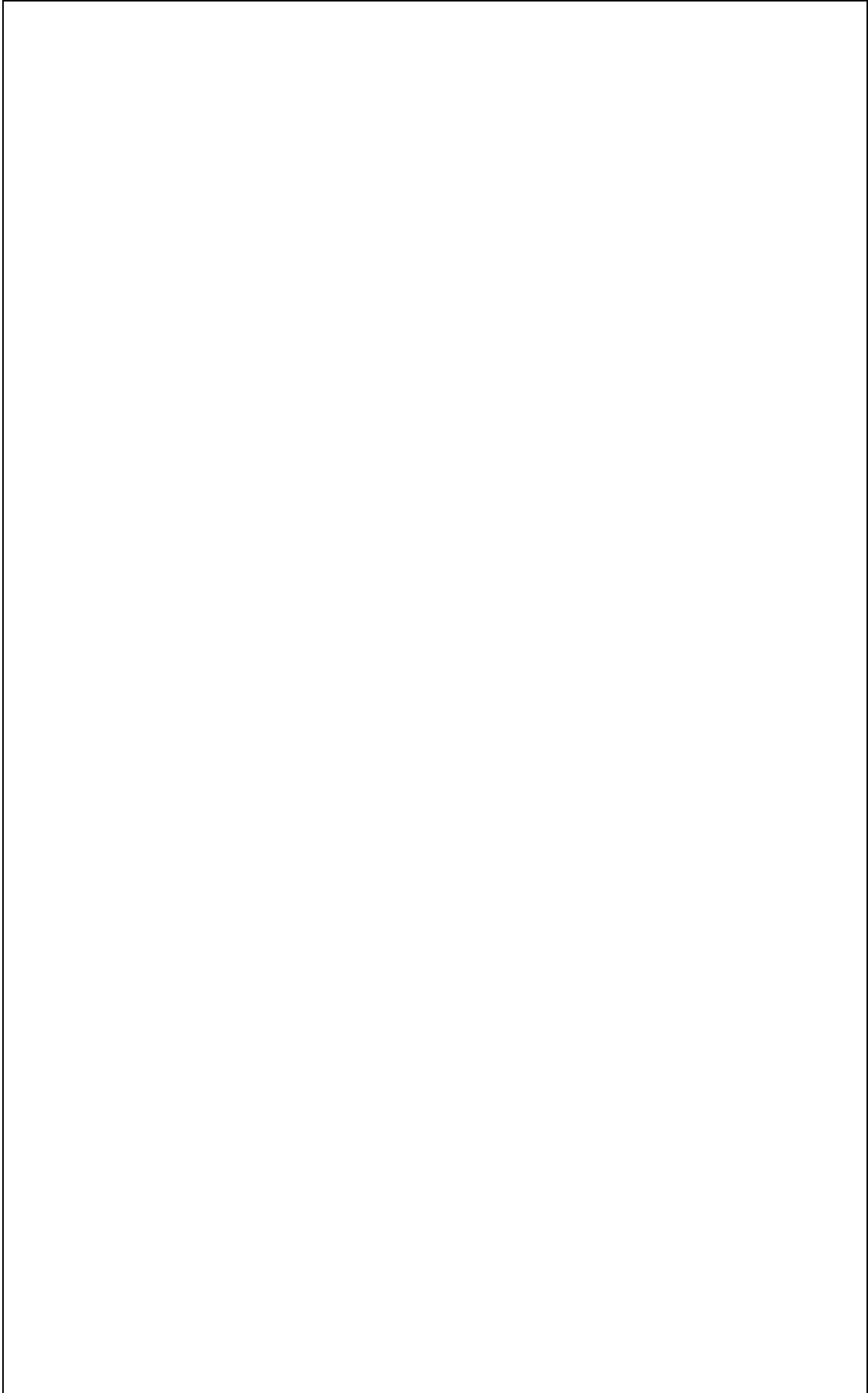********************