

UNIVERSITY OF PORTSMOUTH

FACULTY OF TECHNOLOGY

Department of Electronic and Computer Engineering

B142L – Introduction to Computing

U13746

Date: 20 May 2008

Time: 2 hours

INSTRUCTIONS

Write your student ID number clearly on page 2.

Write your answers to all 10 questions within the spaces provided in this examination paper.

Handwritten notes are permitted with this examination.

Calculators permitted are:

Casio FX 85WA

Casio FX 83WA

Casio FX 85MS

Examiner:

Professor Ron Pethig, Chi Nguyen

Student ID Number

SOLUTIONS

QUESTION 1A. Place an "X" in the box next to **3 terms** that are **basic data types** in the C language. [3 marks]

<input type="checkbox"/>	string	<input type="checkbox"/>	byte
<input type="checkbox"/>	text	X	character
<input type="checkbox"/>	array	<input type="checkbox"/>	real
X	short	<input type="checkbox"/>	null
<input type="checkbox"/>	time	X	integer

QUESTION 1B. Write a C program to ask the name, weight and gender of a user. Store the input values in data variables. Show or use in your program all of the terms you selected in Question 1A. [7 marks]

```
int main( void )
{
    /* array of character data type */
    char user[ 64 ];

    /* short data type */
    short gender = 0;

    /* integer data type */
    int weight = 0;

    printf( "Please enter your name: " );
    scanf( "%10s", user );

    printf( "Please enter your weight: " );
    scanf( "%d", &weight );

    printf( "Please enter 1 if you are male or 2 if you are female: " );
    scanf( "%hd", &gender );
}
```

Consider the following source code to answer Question 2. Line numbers have been provided for reference. Indicate specific line numbers in your answers when necessary.

```
01: int main( void )
02: {
03:     char code = "a";
04:     int flag = 31;
05:
06:     if ( code = "a" )
07:     {
08:         if ( flag => 20 )
09:             printf( "Part 2 is done" );
10:
11:         if ( flag != 30 )
12:             printf( "Part 3 is done" );
13:     }
14:     then
15:     {
16:         printf( "Part 1 is done" );
17:     }
18: }
```

QUESTION 2. Modify the source code to correct all errors. [10 marks]

```
int main( void )
{
    char code = 'a';
    int flag = 31;

    if ( code == 'a' )
    {
        if ( flag >= 20 )
            printf( "Part 2 is done" );

        if ( flag != 30 )
            printf( "Part 3 is done" );
    }
    else
    {
        printf( "Part 1 is done" );
    }
}
```

QUESTION 3A. Place an "X" in the box next to 3 terms that are most directly related to the use of selection and decisions in a C program. [3 marks]

<input type="checkbox"/>	break condition	<input type="checkbox"/>	next
<input checked="" type="checkbox"/>	test condition	<input checked="" type="checkbox"/>	else
<input type="checkbox"/>	error condition	<input type="checkbox"/>	for
<input type="checkbox"/>	stdout	<input checked="" type="checkbox"/>	if
<input type="checkbox"/>	stdin	<input type="checkbox"/>	loop

QUESTION 3B. Write a C program to ask for an input number and display a message that it is an odd or even number. Show or use in your program all of the terms you selected in Question 3A. [7 marks]

```
int main( void )
{
    int input;

    printf( "Please enter a number: " );
    scanf( "%d", &input );

    if ( input % 2 ) /* This is the test condition */
        printf( "That is an odd number.\n" );
    else
        printf( "That is an even number.\n" );
}
```

Consider the following source code to answer Question 4. Line numbers have been provided for reference. Indicate specific line numbers in your answers when necessary.

```
01: int main( void )
02: {
03:     int counter, max;
04:
05:     scanf( "%d", &max );
06:
07:     for ( counter = 0; counter <= max; counter++ )
08:     {
09:         if ( ( counter % 3 ) < 2 )
10:             printf( "%d", counter );
11:         else
12:             printf( "%d", counter - 1 );
13:     }
14:
15:     printf( "\n" );
16: }
```

QUESTION 4A. List the program output when the input value is 10.
[7 marks]

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QUESTION 4B. Describe input values for which the program would not produce any output. [3 marks]

Values less than 0.

QUESTION 5A. Place an "X" in the box next to **3 terms** that are **most directly related to the use of arrays** in a C program. [3 marks]

X	index		default
	tail		static
X	element		auto
	limit	X	type
	shift		head

QUESTION 5B. Write a C program that **stores the following numbers in an array and displays the average value.** Show or use in your program **all of the terms you selected in Question 5A.** [7 marks]

34, 59, 24, 45, 32, 29, 30, 27, 12, 18

```
int main( void )
{
    /* array type is integer */
    int numbers[] = { 34, 59, 24, 45, 32, 29, 30, 27, 12, 18 };
    int counter, total;

    for ( counter = 0, total = 0; counter < 10; counter++ )
    {
        /* counter variable is acting as the array index */
        /* add the value of the current array element */
        total += numbers[ counter ];
    }

    printf( "%d\n", total / counter );
}
```

Consider the following source code to answer Question 6. Line numbers have been provided for reference. Indicate specific line numbers in your answers when necessary.

```
01: int main( void )
02: {
03:     int number = 50;
04:     while ( number <= 1 )
05:     {
06:         printf( "Number: " );
07:         scanf( "%n", number );
08:
09:         if ( number < 50 )
10:             number = 0;
11:     }
12: }
```

QUESTION 6. The program above is intended to ask for an input number and continues to ask until a valid number in the range of 1-50 is entered. Modify the source code to correct all errors. [10 marks]

```
int main( void )
{
    int number = 0;
    while ( number < 1 )
    {
        printf( "Number: " );
        scanf( "%d", &number );

        if ( number > 50 )
            number = 0;
    }
}
```

Consider the following source code to answer Question 7. Line numbers have been provided for reference. Indicate specific line numbers in your answers when necessary.

```
01: int main( void )
02: {
03:     int years[ 20 ] = { 0 };
04:     int counter;
05: }
```

QUESTION 7A. Modify the source code to accept 20 input numbers and store the values in the array. [5 marks]

```
int main( void )
{
    int years[ 20 ] = { 0 };
    int counter;

    for ( counter = 0; counter < 20; counter++ )
    {
        printf( "Number: " );
        scanf( "%d", &years[ counter ] );
    }
}
```

QUESTION 7B. Modify the source code to replace all values in the array that are below 1 or above 50 with the value zero. [5 marks]

```
int main( void )
{
    int years[ 20 ] = { 0 };
    int counter;

    for ( counter = 0; counter < 20; counter++ )
    {
        printf( "Number: " );
        scanf( "%d", &years[ counter ] );
    }

    for ( counter = 0; counter < 20; counter++ )
    {
        if ( ( years[ counter ] > 50 ) || ( years[ counter ] < 1 ) )
            years[ counter ] = 0;
    }
}
```

QUESTION 8A. Place an "X" in the box next to **3 terms** that are **most directly related to the use of functions** in a C program. [3 marks]

X	local variable	X	prototype
X	parameter		switch
	sizeof		continue
	cast		statement
	exit		compound

QUESTION 8B. Write a C function that performs calculations using 2 input integer values and the formula below. The function returns the result of the calculation as a floating point value. Show or use in your program all of the terms you selected in Question 8A. [7 marks]

$$\text{result} = (x + y) / 12$$

```

/* This is a function prototype */
float calculate( int, int );

int main( void )
{
    printf( "%F", calculate( -4, 40 ) );
}

/* x and y are function parameters */
float calculate( int x, int y )
{
    /* result is a local variable */
    float result;

    result = ( x + y ) / 12.0;
    return result;
}

```

Consider the following source code to answer Question 9. Line numbers have been provided for reference. Indicate specific line numbers in your answers when necessary.

```
01: #include <stdio.h>
02:
03: int main( void )
04: {
05:     char file_name[] = "C:\\\\verse.c";
06:     FILE *input = NULL;
07: }
```

QUESTION 9A. Modify the source code to display the contents found in the data file. [6 marks]

Add between lines 6 and 7:

```
char line[ 256 ] = { '\0' };
input = fopen( file_name, "r" );
if ( input != NULL )
{
    while( fscanf( input, "%s", line ) != EOF )
        printf( "%s\n", line );

    fclose( input );
}
```

QUESTION 9B. Modify the source code from Question 9A to ignore any lines starting with the symbol #. [4 marks]

Add between lines 6 and 7:

```
char line[ 256 ] = { '\0' };
input = fopen( file_name, "r" );
if ( input != NULL )
{
    while( fscanf( input, "%s", line ) != EOF )
    {
        if ( line[ 0 ] != '#' )
            printf( "%s\n", line );
    }

    fclose( input );
}
```

QUESTION 10. Write a C program that displays the results of converting the following 4 strings by replacing all spaces found with asterisks. For example, an input string of "My name is Alice" would be displayed as "My*name*is*Alice". [10 marks]

```
"My name is Alice."  
"The truck has a red color."  
"That house is full."  
"All done now."
```

```
#include <string.h>  
  
int main( void )  
{  
    char line1[] = "My name is Alice."  
    char line2[] = "The truck has a red color."  
    char line3[] = "That house is full."  
    char line4[] = "All done now."  
    char *lines[ 4 ] = { line1, line2, line3, line4 };  
    char *line;  
    int counter, index;  
  
    for ( counter = 0; counter < 4; counter++ )  
    {  
        line = lines[ counter ];  
        printf( "%s\n", line );  
        for ( index = 0; index < strlen( line ); index++ )  
        {  
            if ( line[ index ] == ' ' )  
                line[ index ] = '*';  
        }  
        printf( "%s\n", line );  
    }  
}
```