Charles Darwin University

Final Examination

Family Name						
Given Name/s						
Student Number						
Teaching Period	Semester 1, 2018					

HIT365 – C Programming	DURATION	
	Reading Time:	10 minutes
	Writing Time:	180 minutes

INSTRUCTIONS TO CANDIDATES

a. Attempt ALL 9 questions.

b. All answers are to be written in the answer booklet provided.

c. Questions ARE NOT of equal value. Marks are shown for all questions. The total marks for this examination is 100%.

d. Read all the questions carefully before attempting.

e. This examination is worth 50% of the total assessment for this unit.

EXAM CONDITIONS

<u>You may begin writing from the commencement of the examination session.</u> The reading time indicated above is provided as a guide only.

This is a CLOSED BOOK examination

No calculators are permitted

No handwritten notes are permitted

No dictionaries are permitted

ADDITIONAL AUTHORISED MATERIALS	EXAMINATION MATERIALS TO BE SUPPLIED
No additional printed material is permitted	1 x 20 Page Book

THIS EXAMINATION IS PRINTED DOUBLE-SIDED.

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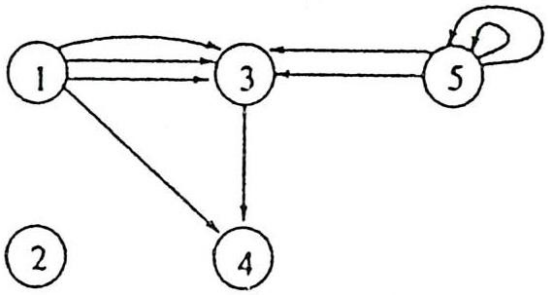
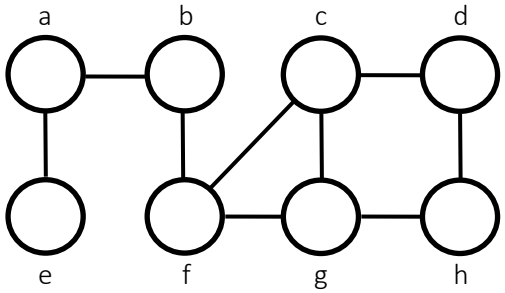
Question 1

(a) Explain the meaning of "pass-by-reference" and "pass-by-value" in C programming.

(b) List all the edges in the following multigraph.



(c) Perform a breadth first search starting from vertex b.

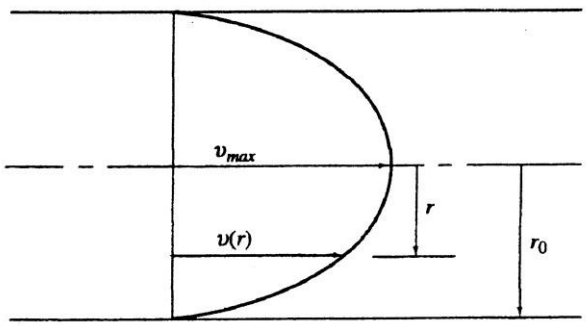


(10 marks)

Question 2

In this question, we address the flow of oil through a pipeline. Friction between the liquid and the wall of the circular pipe causes a velocity profile to develop in the flowing oil. Oil which is in contact with the walls of the pipe is not moving at all, while oil at the centre of the flow has the highest velocity. The diagram below gives an idea of how the velocity of the oil varies across the diameter of the pipe and defines the variables used in this analysis. The following equation describes the velocity profile:

$v(r) = V_{max}(1-r/r_0)^{0.2}$ where $r_0 = 1.83$ m and $V_{max} = 1.25$ m/s



(a) Draw a flowchart of the function **main( )** of a program that computes the velocity, v(r), in the pipeline at a certain position. The program should ask the user to enter the radius **r** (in m) from the keyboard. The computation of the velocity v(r) should be done in the function **profile( )** which is called from **main( )**. The result should be displayed on the screen by function **main( )** and the user should then be asked to enter **y** or **n** to indicate whether he/she wants to do another calculation. If **y** is entered, the program should calculate the velocity from another entry, otherwise the program should stop. If a radius is selected by the user, which is larger than r_0 (outside the pipe), the program should warn the user and ask them to select a smaller value.

(b) Write the program **main( )** based on the flow chart in the question above. For the function **profile( )**, as described in the question above, use **radius** and **vel** only as variables in the function **profile( )**. **DO NOT** declare any additional variables.

(20 marks)

Question 3

Write a program that calculates and prints the product of the even integers from 4 to 20.

(10 marks)

Question 4

Write statements to accomplish the following:
(a) Define matrix to be an integer array and to have 2 rows and 2 columns. Assume the symbolic constant LENGTH has been defined to be 2.
(b) Use a for repetition statement to initialize each element of matrix to the product of its subscripts. Assume the integer variables a and b are defined as control variables.
(c) Write the statements to print the values of each element of array matrix. Assume the matrix was initialized with the definition: int matrix [LENGTH][LENGTH] ={ { 1 }, { } };

(12 marks)

Question 5

What is the output of the following program if the user enters "awesome program"? Explain your answer.

```
#include <stdio.h>
void AFunction();

int main()
{
   printf("Enter a sentence: ");
   AFunction();

   return 0;
}
```

```
void AFunction()
{
   char c;

   scanf("%c", &c);
   if( c != '\n')
   {
      AFunction();
      printf("%c",c);
   }
}
```

(9 marks)

Question 6

Write a program that generates 4 random numbers. Each random number is within the range of 1 to 13.

(12 marks)

Question 7

The following program passes the variable number by value to the function cubeByValue.

```
#include <stdio.h>

int cubeByValue( int n ); // prototype

int main( void )
{
   int number = 5;

   printf( "The original value of number is %d", number );

   number = cubeByValue( number );

   printf( "\nThe new value of number is %d\n", number );
}

int cubeByValue( int n )
{
   return n * n * n; // cube local variable n and return result
} // end function cubeByValue
```

Write a program that performs the same function as the above program but the variable number is passed by reference to the function cubeByValue. Hint: Use pointer.

(12 marks)

Question 8

Assume that integer array b[5] and integer pointer variable bPtr have been defined. Write a statement to set bPtr equal to the address of the first element in array b. Write a statement using pointer expression to reference the array element b[3].

(6 marks)

Question 9

Provide the definition for each of the following structures:
(a) Structure time containing integers hours, minutes and seconds.
(b) A structure called month that contains character arrays monthName[30], daysOfWeek[20], and an integer variable numberOfDays.

(9 marks)