STIW3013 CONFIDENTIAL

FINAL EXAM
FIRST SEMESTER SESSION 2011/2012

COURSE CODE / NAME: STIW3013 SYSTEM PROGRAMMING
DATE: 01 JANUARY 2012 (SUNDAY)
TIME: 9.00 – 11.30 A.M. (2½ HOURS)
VENUE: TE

INSTRUCTION:

1. This book script contains FIFTEEN (15) questions in EIGHT (8) printed pages excluding the cover page.
2. Answer ALL QUESTIONS in the spaces provided.
3. You are NOT ALLOWED to remove the exam paper from the examination hall.

MATRIC NO: ________________________________ (with word)
IDENTIFICATION CARD NO.: ____________ (with number)
LECTURER: ________________________________
GROUP: ________ TABLE NO.: ______________

DO NOT OPEN THIS EXAMINATION PAPER UNTIL INSTRUCTED

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ANSWER ALL QUESTIONS IN THE SPACES PROVIDED

1. System software on a Unix system performs the same basic services as system software on a Microsoft Windows system. However, there are some fundamental differences in how the system software is designed and developed. Describe **TWO (2)** differences between Unix system and Windows system.

   (4 marks)

2. Money in the United States is valued according to dollars and cents, where the dollars can have any non-negative whole value and cents can have a whole value from 0 to 99. What C variable type should be used to store monetary values? Why?

   (2 marks)

3. What is the output of the following code?

   ```c
   int x = 15;
   x = (x|20)<<2;
   printf("%d\n", x);
   ```

   (2 marks)
4. Convert each of the following bit patterns into whole numbers. Assume the values are stored using two’s complement bit model.

   (4 marks)
   
a) 01001111

   b) 00011010

   c) 10110011

   d) 10011111

5. A phonebook typically lists the name, address, and telephone number of everyone living in an area. Write C code defining a structure template that could be used to store this data. Assume that a name and address will be no more than 30 characters each, and that a telephone number has exactly seven digits.

   (4 marks)
6. Write a vi editor command based on the following task. (8 marks)
   
a) Delete five lines starting with the current line.
   
b) Change to end of third word.
   
c) Replace the string 'bigger' on the current line with 'biggest'
   
d) Find the next word that starts with an 'a', 'd' or 'r'

7. List SEVEN (7) methods to organize code. (7 marks)
8. What is a system call? Give ONE (1) reason of using system calls. (3 marks)

9. Write a C program that uses a system function call to sort itself, piping the sorted version to a file called sorted-code. For sorting, the system call should use the sort system program. Assume that your code is saved in a file named code.c. (5 marks)

20. A program has been written that makes use of both the math library and a custom widget library. The code for the program is stored in a file named myprog.c. The math library file resides in a standard system directory but the widget library file, named libwidget.a, resides in a custom directory /lib/widget. For the gcc compiler, write the necessary command to compile the code and build an executable, including all command line arguments. (5 marks)
11. Write out the memory map for the following code, providing all values at the end of execution.

```c
#include <stdio.h>
#include <unistd.h>
main()
{
    int i, j, k;
    k=0;
    for (j=0; j<4; j++)
        k=k+j;
    i=fork();
    if (i==0)
        j=j+k;
    else
        i=k%3;
    printf("%d %d %d\n", I, j, k);
}
```

(7 marks)

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12. Write a shell scripts to display username, current date, time, and current directory.

(4 marks)
13. Write a shell script to print a given number in reverse order. For example, if the number is 223, it must print as 321.

(10 marks)
14. Write a memory map for the following code. Show all the values at the end of execution of the program.

```c
#include <stdio.h>
main()
{
    int x[2][3][2];
    int i, j, k;
    for (i=0; i<3; i++)
        for (j=0; j<2; j++)
            x[0][i][j] = i*4+j*2;
    for (k=0; k<2; k++)
        for (j=0; j<2; j++)
            x[1][k][j]=x[0][j][k] - 2;
}
```

(15 marks)
15. Write a program that reads a text file and report the total count of words of each length. A word is defined as any contiguous set of alphanumeric characters, including symbols. For example, in the current sentence there are 10 words. The filename should be given at the command line as an argument. The file should be read one word at a time. A count should be kept for how many words have a given length. For example, the word 'uum' is 3 bytes in length; the word 'malaysia' is 8 bytes in length. The program should report the total word counts of all lengths between 3 to 15 bytes. Words with lengths outside that range should not be counted.

(20 marks)