

University of Victoria  
Examinations April 2002  
SENG265 S01 – Introduction to Software Engineering

Name: \_\_\_\_\_

Student no. \_\_\_\_\_

Instructor: Michael Zastre

Section: S01

Duration: 3 hours

**To be answered on the paper**

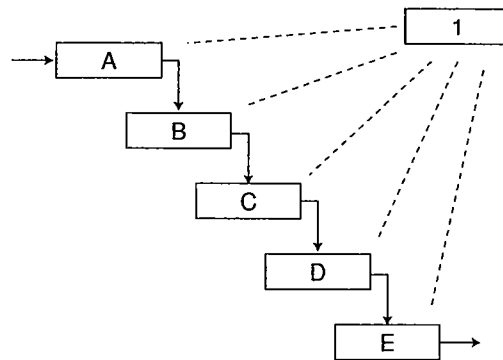
Students must count the number of pages in this examination paper before beginning to write, and report any discrepancy immediately to the invigilator.

This question paper has 14 pages.

- You must obtain permission from an invigilator to temporarily leave the examination room.
- You are allowed to use a single-sided, letter-sized cribsheet. No other aids are allowed.
- Write legibly.

Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total (100 max)	

**Question 1. Software Engineering (waterfall model) – 10 marks**



- a. For each label in the boxes above, provide the name of the stage in the waterfall model of software development.
  
  
  
  
  
  
  
  
  
  
- b. What is the output of each stage?
  
  
  
  
  
  
  
  
  
  
- c. Name and describe an alternative described in lectures to the waterfall model.

**Question 2. Perl programming – 5 marks**

Assume the following Perl script:

```
#!/usr/bin/perl

%marks = ("alpha" => 60, "bravo" => 90,
          "charlie" => 75, "delta" => 80);

while (<>) {
    chomp $_;
    ($s1, $s2, $g) = split(/\s+/, $_);
    $snum2group{$s1} = $g;
    $snum2group{$s2} = $g;
}

foreach $s (sort (keys %snum2group)) {
    print "student ", $s, " group ",
          $snum2group{$s}, " has grade ",
          $marks{$snum2group{$s}}, "\n";
}
```

Further, assume the following input is given to this script:

```
9381100 0072451 delta
9572113 9991331 alpha
0180001 0292211 tango
8993344 9782331 charlie
```

What is the output of this program? If there is a runtime error, please explain it.

**Question 3. Perl regular expressions – 15 marks**

For each set of strings at the top, list one Perl pattern that “matches” all items in the set (use pattern number to specify a pattern). Note that there are more patterns than string sets i.e. it is not necessary for all patterns to be used for this question. Each string in a set is surrounded by quotes.

String sets	Matching patterns
"bb", "bab", "baab"	
"123", "456", "708"	
"this is the time!"	
"MATH 232A", "C SC 320", "ASTR 100", "ED-E 445A)	
"red green", "blue yellow", "orange violet beige"	
"/usr/bin/", "/home/seng265/src", "/root"	
"a", "aaa", "aaab", "baba"	
"34z6", "7h99", "12a", "00x0"	
"0xffff", "0x30", "0x0", "0x12911"	
"jack and jill", "run and jump", "sink or swim", "laugh and play"	

Number	Pattern
1	/^[ab]+/
2	/(\w+\s){1,2}/
3	/^.*!\$/
4	/\w[\s\w-]+\s\d{3}\w?/
5	/b[a]*b/
6	/dogs cats/
7	/\d\w\w\d?/
8	/d{2,5}/
9	/(\ \w+)+/
10	/0x[0-9a-f]?/
11	/((jack)(run)(sink)(laugh)   (and)(or)   (jill)(jump)(swim)(play))/
12	/^0x[0-9a-f]?[0-9a-f]+/
13	/((jack run sink laugh) (and or) (jill jump swim play))/

**Question 4. ANSI C syntax – 5 marks**

The following code has several syntax errors. List these errors by writing down (a) the line number (b) what is incorrect about the line. If a line has more than one error, list each error separately.

```
01  #include <stdio.h>;
02  #include <stdlib.h>;

03  struct {
04      float sum;
05      int  freq;
06  } result;

07  integer main(void)
08  {
09      int i;
10      int val;
11      char buffer[20];

12      for (i=0; i<10; i++) {
13          fgets(buffer, 20, stdin);
14          val = atoi(buffer);
15          result.sum += val;
16          result.freq += 1;
17      };

18      int foo() { return 12; }

19      printf("%f %d %d", result.sum, result.freq, foo());

20      return 0;
21  }
```

**Question 5. C types and malloc – 10 marks**

- a. Construct ANSI C aggregate types to be used for storing music CD information. You can assume there are no more than 35 tracks; each track will have title info plus a playing length in minutes and seconds; each CD has a title and running length; and each CD has an artist.
- b. Please declare and define the function `init_cd_database(int n)` which dynamically allocates memory for an array of CDs where the number of CDs is `n`. The array pointer is passed back as a return value.
- c. Consider a CD with the following attributes:  
CD title - "Greatest Lectures of SENG265"  
CD artist - "George W. Bush"  
track 1 title - "White House Black Box Tests"; length - 30' 24"  
track 2 title - "Perl scripts in Texas and Florida"; length - 24' 55"  
Write code which would add this CD information to the first element of the CD array.

**Question 6. C programs – 15 marks**

- a. What is the output of the following program? Write your answer in the lines provided below.

```
1  #include <stdio.h>
2
3  int c = 99;
4
5  int mystery(int a, int b)
6  {
7      int temp;
8      temp = a;
9      a = b;
10     b = temp;
11
12     return temp;
13 }
14
15 int main()
16 {
17     int x = 10;
18     int y = 20;
19     int z = 30;
20     printf("%d %d %d %d\n", c, x, y, z);
21     c = mystery(x, y);
22     printf("%d %d %d %d\n", c, x, y, z);
23     c = mystery(z, c);
24     printf("%d %d %d %d\n", c, x, y, z);
25 }
```

Output

---

---

---

---

**Question 6 (continued)**

- b. What is the output of the following program? Write your answer in the lines provided below.

```
1  #include <stdio.h>
2  int main()
3  {
4      int a[3] = {11, 22, 33};
5      int b = 1000;
6      int *p1 = &b;
7      int *p2 = a;
8      int *p3 = &a[2];
9
10     printf("%d %d %d %d %d %d %d\n", a[0], a[1], a[2],
11         b, *p1, *p2, *p3);
12
13     *p2 = 44;
14     p3 = p1;
15     *p3 = 55;
16     printf("%d %d %d %d %d %d %d\n", a[0], a[1], a[2],
17         b, *p1, *p2, *p3);
18
19     a[2] = 99;
20     *p3 = 101;
21     printf("%d %d %d %d %d %d %d\n", a[0], a[1], a[2],
22         b, *p1, *p2, *p3);
23
24     *(p2 + 1) = 555;
25     a[0] = 777;
26     printf("%d %d %d %d %d %d %d\n", a[0], a[1], a[2],
27         b, *p1, *p2, *p3);
28 }
```

Output

---

---

---

---

---



- a. What are the different *access specifiers* available to a C++ class? What do they mean?
- b. What is “operator overloading” and how might it help a software engineer?

**Question 7 (continued)**

- c. What are is the output of the following C++ code? Write your answer in the lines provided below.

```
#include <iostream>

int c = 10;

void mystery1 (int a, int b)    { c = a + b + c; a = c - a; b = c - b; }
void mystery2 (int& a, int b)   { c = a + b + c; a = c - a; b = c - b; }
void mystery3 (int a, int& b)   { c = a + b + c; a = c - a; b = c - b; }
void mystery4 (int &a, int& b)   { mystery3 (b, a); }

int main() {
    int x = 20; int y = 30;
    cout << x << " " << y << " " << c << endl;
    mystery1 (x, y);
    cout << x << " " << y << " " << c << endl;
    mystery2 (x, y);
    cout << x << " " << y << " " << c << endl;
    mystery3 (x, y);
    cout << x << " " << y << " " << c << endl;
    mystery4 (x, y);
    cout << x << " " << y << " " << c << endl;
}
```

**Output**

---

---

---

---

---

**Question 8. Testing – 5 marks**

Unit testing is the first stage of testing. Using point form, list the other five stages of testing and describe what they accomplish.

a. What is the meaning of the term “defensive programming”?

- b. If you have no easy clues from which to track down the source of a bug, what strategies could you use? Describe two such strategies, giving an example for each.

**Question 9 (continued)**

- d. Write a C-language implementation of:

```
char* min3string(char *s1, char *s2, char *s3)
```

which returns a pointer to the string which is the “least” of the three (i.e. comes earliest in alphabetical order). Use “strcmp()” to compare strings. Where needed, use “assert()” appropriately to describe how you assume min3string is to be used.

**Question 10. Software Engineering: Methodology – 10 marks**

One of the “principles of software development” is that you must "expect to deal with change" or “plan for change”. For instance, specifications may change, tests may highlight flaws in the design, etc. Describe two things you have learned from this course that can be used to observe the principle given above. Write your answers in point form.

**END**