

COL100M Minor 1

Aman Godara

TOTAL POINTS

24 / 29

QUESTION 1

11 1 / 1

✓ + **1 pts** Correct

+ **0.5 pts** 'd' missing

+ **0.5 pts** 'rw' missing

+ **0.5 pts** Correct but 'x' extra

+ **0 pts** Incorrect/Unattempted

QUESTION 2

22 1 / 1

✓ + **1 pts** Correct

+ **0.5 pts** Only 2 parent directory links followed instead of 3

+ **0.5 pts** Two cd commands used.

+ **0.5 pts** Missed one directory change in between

+ **0.5 pts** Missing forward slashes

+ **0.25 pts** Only one parent directory link followed instead of 3

+ **0.25 pts** Missed one parent link pointer as well as one directory change

+ **0 pts** Incorrect/Not Attempted

QUESTION 3

3 4 pts

3.1 3a 0.5 / 0.5

✓ + **0.5 pts** Correct

+ **0.25 pts** Partially Correct

+ **0 pts** Incorrect/Unattempted

3.2 3b 1 / 1

✓ + **1 pts** Correct

+ **0 pts** Incorrect/Unattempted

+ **0.5 pts** Partially Correct

3.3 3c 1 / 1

✓ + **1 pts** Correct : 1, int

+ **0.5 pts** Value (= 1) is correct but the type (= int) is not mentioned.

+ **0 pts** Incorrect. The correct answer is 1 of type int.

$1 + (2 / 8) = 1 + 0 = 1$. (Uses integer division)

+ **0.5 pts** Value (= 1) is incorrect but type (= int) is correct.

+ **0 pts** No Attempt.

3.4 3d 1.5 / 1.5

✓ + **1.5 pts** Correct

+ **0 pts** Incorrect / Unattempted

+ **0.5 pts** Identified that error has occurred

+ **1 pts** Error identified but partially correct or incomplete

+ **0.5 pts** Grace marks for identifying a possible different error because of lack of knowledge of precedence of operators

QUESTION 4

44 1 / 1

✓ + **1 pts** Correct

+ **0 pts** Incorrect / Unattempted

QUESTION 5

5 11 pts

5.1 5a 3 / 3

✓ + **1 pts** Signature correct.

✓ + **2 pts** Description correct.

+ **1 pts** Description partially correct.

+ **0 pts** Completely wrong

5.2 5b 2 / 4

+ **2 pts** Completely correct; even if list instead of `a list

+ 1 pts Structure correct but data type partially correct; structure almost correct, only type of x is incorrect.

+ 1 pts Input , output correctly specified

+ 2 pts Description completely correct

✓ + 1.5 pts Description correct, but doesn't specify what happens if $n > \text{len}(l)$

+ 1 pts Description says replaces the nth element

+ 0.5 pts Description makes some sense

+ 0 pts Completely wrong

+ 0.5 Point adjustment

☹ return type missing in signature; Description doesn't specify what happens if $n > \text{length } l$

5.3 5c 3 / 4

+ 2 pts Signature, completely correct

✓ + 1 pts Identifies that there are two function parameters.

+ 0 pts If functions have not been identified at all, then no marks can be given.

✓ + 2 pts Description, completely correct. $h(g(x))$

+ 1 pts Description says finds $h(g(x))$, but either from $g(h(x))$ or equals $f(g(h(x)))$, or some other roundabout way.

+ 0 pts Description incorrect.

☹ return type not included in function signature

QUESTION 6

6 6 2 / 2

+ 0.5 pts Correct for empty list

+ 0.5 pts Correct for single element list

+ 1 pts Correct for recursive case

+ 0.5 pts Base cases correct but syntax incorrect

+ 0 pts incorrect

+ 0.5 pts recursive case partially handled

✓ + 2 pts Works, but is not a single, recursive function. Instead uses a helper recursive function.

QUESTION 7

7 4 pts

7.1 7a 2 / 2

✓ + 2 pts Answer is 2

+ 0 pts Incorrect, Answer is 2

7.2 7b 0 / 2

✓ + 0 pts Answer is 22

+ 2 pts Correct

QUESTION 8

8 5 pts

8.1 8a 3 / 3

- 3 pts Blank/Incorrect

- 2 pts Recurrence written wrong/ Not written

- 0.5 pts Mention what happens otherwise, like if $n < 0$, then it is undefined

- 0.5 pts Base Case should be $\text{fib}(1) = 1$ and $\text{fib}(2) = 1$.

For negative numbers its not 1.

- 0.5 pts Incorrect Base Case

- 3 pts Mathematical formula was asked and not ocaml code

✓ - 0 pts Correct

8.2 8b 2 / 2

✓ + 2 pts Correct

+ 1.5 pts Wrong towards the end/start

+ 1 pts Half wrong

+ 0 pts Wrong sequence

+ 0 pts Blank

COL100 – Minor exam 1

Feb. 3, 2018

NAME:

AMAN GODARA

STUDENT ID:

2017TT10876

1 Instructions

1. Write your answers *only in the space provided*. We are using software which automatically detects the answer region. If you write in the margins or in the wrong space, *your answer will not be graded*.
2. No calculators, phones, notes, or other resources are allowed. This is a closed book exam.
3. Time allocated for the exam: *1 hr*.

2 Exam begins here

1. (1 mark) Suppose a directory `personal` has read and write access for users, but no access for groups and others, write the *permission string* that would be displayed on typing the command `ls -l personal`.

drw-----

2. (1 mark) Suppose the directory structure is organised as in Figure 1 and your current working directory is as shown. Write a *single* `cd` command to go from your current directory to the directory indicated using a *relative path*.

../-.././calculator.app/contents/MacOS

3. (.5+1+1+1.5 marks) For each expression below, write the value that is returned and its type. If there is an error, state what error is returned (in plain English).

(a) `"1" ^ string_of_int 1`

"1" string

(b) `(1 < 2) = false`

~~false~~ ~~bool~~ False bool

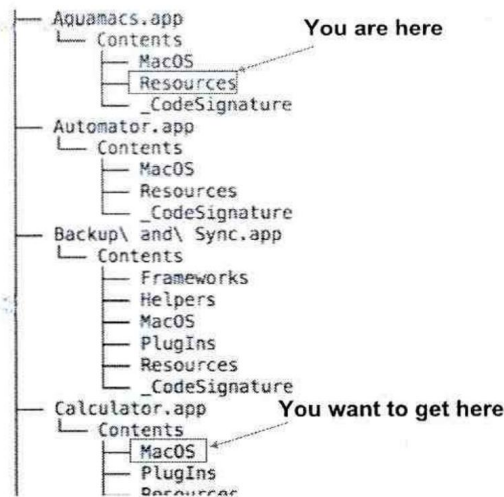


Figure 1: Question 2: Directory structure

(c) $1 + 2 / 8$

1 int

(d) `string_of_int (float_of_int 2) ^ "2"`

error float of int (2) returns float but int was expected

4. (1 mark) What is the value of x in the following code snippet?

```
let y = 5 in
let z = y+4 in
let x = z*5 in
let z = x+1 in
let x = y*(z+1) in x
```

2 3 5

5. ((1+2)+(2+2)+(2+2) marks) For each function below (all named `f`), (i) Write the signature of the function (your notation should conform to that returned by the OCaml top level. That is, for function `let add a b = a+b`, write `int -> int -> int`), and, (ii) write a *one sentence* description of what the function does (for example, for function `add`, write "adds integers a and b").

(a) `let rec f a b =
 if b = 0 then a else f b (a mod b)`

`int -> int -> int`

"finds greatest common divisor"

(b) let rec f x n l =
 match l with
 | [] -> [x]
 | h :: t -> if n = 0 then x :: l
 else h :: f x (n-1) t

$a' \rightarrow \text{int} \rightarrow a' \text{ list}$

"put a number, string... etc(n) in the list such that there are n terms before n."

(c) let f g h x = let y = g x in h y

$(a' \rightarrow b') \rightarrow (b' \rightarrow c') \rightarrow a'$

"it finds $h(g(n))$ "

6. (2 marks) Write a *single, recursive* function `altrnt: 'a list -> 'a list` in OCaml, that takes in a list `lst` and returns a list containing every *alternate* element of `lst` starting from the first element (that is, the first element should be returned in the list). (Note: No partial marks will be awarded for this question.)

```
let rec altrnt l -> match l with
| [] -> []
| h :: t -> h :: (altrnt t)
| h :: [] -> [h] ;;
```

7. Define $h(n), n \geq 0$ as follows:
 $h(0) = 0$
 $h(n) = n - h(h(n-1)), n > 0$

Answer the following questions:

- (a) (2 marks) What is $h(3)$?

2

- (b) (2 marks) When translated into a recursive function in OCaml, which takes in n and returns the n^{th} element in the sequence, `h: int -> int` and that follows the recursion above exactly, how many times is the function `h` called in `h 3`.

10

8. We learnt about the Fibonacci sequence and how it is recursively defined. Here is a variant on that sequence. The idea is as follows: Let $Q(1) = Q(2) = 1$. For computing $Q(n)$, $n > 2$, we would like to look at the two elements before it – that is, elements at the $(n-1)^{th}$ position and the $(n-2)^{th}$ position. Let the elements at these positions be x and y , then we calculate the $Q(n)$ as the sum of the elements at $(n-x)^{th}$ position and $(n-y)^{th}$ position. Example: Suppose we want to find $Q(5)$, then we look at elements at the 4^{th} and 3^{rd} positions. Let those elements be 3 and 2. We then add the numbers at the $(5-3)^{th}$ and $(5-2)^{th}$ position (that is, the second and third position) to get $Q(5)$.

Answer the following questions:

- (a) (3 marks) Write a recursive mathematical formulation of the above.

$$Q(n) = \begin{cases} 1 & \text{if } n = 1 \\ 1 & \text{if } n = 2 \\ Q(n - Q(n-1)) + Q(n - Q(n-2)) & \text{if } n > 2 \\ 0 & \text{else} \end{cases}$$

- (b) (2 marks) Write the first 10 elements in the sequence.

1	1	2	3	3	4	5
5	6	6				

Use this space for rough work if required. Whatever you write here *will not be graded*.