Started on	Wednesday, 2 February 2022, 8:50 AM
State	Finished
Completed on	Wednesday, 2 February 2022, 9:40 AM
Time taken	50 mins 37 secs
Grade	**13.00** out of 15.00 (**87**%)

Question 1

Correct

Mark 1.00 out of 1.00

Flag question

Check the following Lambda Expression.

```
H = λf. λn. if (= n 0) 1 (* n (f (- n 1)))
```

What does the expression represent?

Select one:

- Predecessor function
- Fibonacci function
- Y Combinator for a recursive function ✓
- Ω

Your answer is correct.

The correct answer is: Y Combinator for a recursive function

Question 2

Incorrect

Mark 0.00 out of 2.00

Flag question

Consider the following functions.

```
( defun fun1 ( list )
    ( cond
         (( endp list ) ( error " Empty list "))
         (t ( loop
              :for result :on list
              : until ( endp ( rest result ))
              : finally ( return result )))))
```

```
( defun fun2 ( list )
    ( cond
        (( endp list ) ( error " Empty list "))
        (( endp ( rest list )) ( error " List too short "))
        (( endp ( rest ( rest list ))) list )
        (t ( fun2 ( rest list )))))
```

Identify the correct input-output combination/s for the functions above.

Select one or more:

- [x] **Input:** func2' (4, 5, 8, 1) ; **Output:** (8, 1) ✓
- [ ] **Input:** func1' (2, 3, 5) ; **Output:** 5
- [x] **Input:** func2' (1, 2, 4) ; **Output:** 4 ✗
- [x] **Input:** func1' (a, b, c) ; **Output:** (b, c) ✗

Your answer is incorrect.

The correct answer is: **Input:** func1' (2, 3, 5) ; **Output:** 5, **Input:** func2' (4, 5, 8, 1) ; **Output:** (8, 1)

Question 3

Correct

Mark 1.00 out of 1.00

Flag question

Evaluate the following lambda Expression.

```
(λx. λy. + x ((λx. (- x 3)) y)) 5 6
```

Select one:

- 15
- 14
- 2
- 8 ✓

Your answer is correct.

The correct answer is: 8

Question 4

Correct

Mark 2.00 out of 2.00

Flag question

Consider the following function definitions.

```
( define fun1
   ( lambda (m n)
       (if (= m 0)
            (+ n 1)
            (if (= n 0)
                ( fun1 (- m 1) 1)
                 ( fun1 (- m 1) ( fun1 m (- n 1)))))))
```

```
( define fun2
    ( lambda (a b)
        (if (= a b)
            a
            (if (> a b)
                ( fun2 (- a b) b)
                ( fun2 a (- b a ))))))
```

Identify the correct statement/s

Select one or more:

- [ ] fun1 finds prime number
- [ ] fun1 evaluates frequency of numbers
- [x] fun2 evaluates gcd of numbers ✓
- [ ] fun2 evaluates lcm of numbers

Your answer is correct.

The correct answer is: fun2 evaluates gcd of numbers

Question 5

Correct

Mark 1.00 out of 1.00

Flag question

Consider the following lambda expressions

```
I.     λt. (λx. t (x x)) (λx. t (x x))
II.    λm. λn. λx. (m (n x))
III.   λg. λf. λx. g (f x)
IV.    λn. λf . λx. (f ((n f ) x))
V.     λx. λy. x
```

and their descriptions

```
1.  Multiplication
2.  Successor
3.  Y Combinator
4.  Constant
5.  Composition
```

Match each lambda expression above with respective proper description.

Select one:

- I-3, II-1, III-5, IV-4, V-2
- I-5, II-2, III-3, IV-1, V-4
- I-5, II-1, III-3, IV-2, V-4
- I-3, II-1, III-5, IV-2, V-4 ✓

Your answer is correct.

The correct answer is: I-3, II-1, III-5, IV-2, V-4

Question 6

Consider the following functions.

Correct

Mark 2.00 out of 2.00

Flag question

```
( defun fun1 ( list i)
  ( cond
    (( not ( integerp i)) ( error " Index error " i))
    (( not ( plusp i)) ( error " Index error " i))
    (t
        ( loop
            :for result :on list
            : while ( plusp ( decf index ))
            : finally (if ( endp result )
               ( error " List error .")
               ( return ( first result )))))))
```

```
( defun fun2 ( list i)
  ( cond
    (( not ( integerp i)) ( error "Non integer index " i))
    (( not ( plusp i)) ( error "Non strictly positive index " i))
    (t (elt list (1- i )))))
```

```
( defun fun3 ( list i)
  (let (( result nil ))
    ( loop while list
      do ( loop repeat (1- i)
          while list
          do ( push (pop list ) result ))
      (pop list ))
    ( nreverse result )))
```

Identify the correct statement regarding the functions.

Select one:

- func2' and func3' perform the same task

- func1' and func2' perform the same task ✓
- func1' and func3' perform the same task
- All are performing the same task

Your answer is correct.

The correct answer is: func1' and func2' perform the same task

Question 7

Correct

Mark 1.00 out of 1.00

Flag question

Identify the correct parenthesization of the following lambda expression.

```
λa b c. E
```

Select one:

- `(λa. (λb c. E))`
- `(λa. ((λb λc). E))`
- `((λa. b. c.) E)`

```
(λa. (λb. (λc. E)))
```

✓

Your answer is correct.

The correct answer is:

```
(λa. (λb. (λc. E)))
```

Question 8

Correct

Mark 2.00 out of 2.00

Flag question

Consider the following functions.

```
( defun foo ( sequence &key (key ( function identity )))
   (let (( table (make -hash - table )))
       (map nil ( lambda ( item ) ( incf ( gethash ( funcall key item )
          table 0))) sequence )
          table ))
```

```
( defun fun ( llist )
    (let* (( data (map 'vector ( lambda ( list ) ( cons ( length list ) list )) llist ))
           ( histo (foo data :key ( function car ))))
(map 'list ( function cdr)
      ( sort data ( function <) :key ( lambda ( item ) ( gethash (car item )
          histo ))))))
```

What will be the output of the function call **fun((u v w) (a b c) (f g))** ?

Select one:

- (a b c) (f g) (u v w)
- (u v w) (a b c) (f g)
- (f g) (u v w) (a b c) ✓
- (f g) (a b c) (u v w)

Your answer is correct.

The correct answer is: (f g) (u v w) (a b c)

Question 9

Correct

Mark 1.00 out of 1.00

Flag question

Consider the following function.

```
(let ((x 2) (y 3))
    (let* ((x 7)
           (z (+ x y)))
      (* z x)))
```

Select one:

- 17
- 70 ✓
- 42
- 35

Your answer is correct.

The correct answer is: 70

Question 10

Correct

Mark 1.00 out of 1.00

Flag question

State whether TRUE or FALSE.

```
Abstraction has higher precedence than Application in a lambda expression.
```

Select one:

- True
- False ✓

The correct answer is 'False'.

Question 11

Correct

Mark 1.00 out of 1.00

Flag question

Consider the following function.

```
foo [] = []
  foo ( x : xs ) = foo small ++ mid ++ foo large
    where
        small = [ y | y <- xs , y < x ]
        mid = [ y | y <- xs , y == x ] ++ [ x ]
        large = [ y | y <- xs , y > x ]
```

What will be the output for the input [3, 6, 4, 8, 1]?

Select one:

- 1, 3, 4, 6, 8 ✓
- 1, 8, 4, 6, 3
- 8, 6, 4, 3, 1
- 4, 6, 8, 3, 1

Your answer is correct.

The correct answer is: 1, 3, 4, 6, 8

Finish review

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