Started on	Wednesday, 23 February 2022, 8:19 AM
State	Finished
Completed on	Wednesday, 23 February 2022, 9:20 AM
Time taken	1 hour
Grade	**14.00** out of 15.00 (**93**%)

Question 1

Correct

Mark 2.00 out of 2.00

Flag question

Consider the below code segment.

```
struct S { void fun(int); };

void S::fun(int i) {
    [&, i] {};          //LINE-1
    [&, &i] {};         //LINE-2
    [=, this] {};       //LINE-3
    [i, i] {};          //LINE-4
    }
```

Which line(s) will be compiled successfully without any error/warning in the C++11 compiler?

Select one or more:

- [ ] LINE-2
- [ ] LINE-4
- [x] LINE-1
- [ ] LINE-3

Your answer is correct.

The correct answer is: LINE-1

Question 2

Correct

Mark 1.00 out of 1.00

Flag question

Consider the following main function.

```
int main()
{
    int m = 0;
    int n = 0;
    [&, n] (int a) mutable { m = ++n + a; }(4);
    cout << m << " " << n << endl;
}
```

What will be the output/error?

Select one:

- (•) 5 0
- ( ) Error in lambda expression.
- ( ) 5 4
- ( ) 0 5

Your answer is correct.

The correct answer is: 5 0

Question 3

Correct

Mark 1.00 out of 1.00

Flag question

Reduce the following lambda expression using α and β reduction rules.

```
(((λx. (λy. (x y)) (λy. y)) w)
```

What will be the reduced expression?

Select one:

- `(λy. y) x`
- `(λy. y) w` ✓
- `(λx. x) w`
- `(λw. w) y`

Your answer is correct.

The correct answer is:

```
(λy. y) w
```

Question 4

Correct

Mark 2.00 out of 2.00

Flag question

Evaluate (Y E), where E is an expression and Y is defined as follows:

```
(λf.(λx.f(x x))(λx.f(x x)))
```

What will be the evaluated/reduced expression?

Select one:

- `(E (Y E))` ✓
- `(E)`
- `(Y E)(E)`
- `(Y (Y E))`

Your answer is correct.

The correct answer is:

```
(E (Y E))
```

Question 5

Correct

Mark 2.00 out of 2.00

Flag question

Consider the below lambda expression. Evaluate it using the normal order strategy.

```
(λa. λb. (* b ((λc. (+ a c)) 3))) 0 5
```

What will be the normal form after the evaluation?

Select one:

- 3
- 15 ✓
- 5
- 0

Your answer is correct.

The correct answer is: 15

Question 6

Correct

Mark 1.00 out of 1.00

Flag question

Given the type of ϕ and Φ is $\xi \rightarrow \xi$

$$((\lambda(z : \xi \rightarrow \xi).\lambda(+ : \xi \rightarrow \xi).\ \lambda(\eta : \xi \rightarrow \xi).\ \lambda(\mu : \xi).\ z\ (+\ (\eta\ (\eta\ \mu))))\ \phi)\Phi$$

What is the type of the above expression? Do not assume any types

Select one:

- (ξ → ξ → ξ)
- (ξ → ξ) → (ξ → ξ) ✓
- (ξ → ξ)
- cannot be determined

Your answer is correct.

The correct answer is:

(ξ → ξ) → (ξ → ξ)

Question 7

Correct

Mark 1.00 out of 1.00

Flag question

$$\lambda(x : S \to Int).\ (\underline{\oint} x)$$

$\underline{\oint}$ is a constant of type $S \to Int \to S \to Int$

What is the type of the above expression? Do not assume any types

Select one:

- `S → Int → S → Int → S → Int`
- `S → Int → S → Int` ✓
- cannot be determined
- `S`

Your answer is correct.

The correct answer is:

`S → Int → S → Int`

Question 8

Correct

Mark 1.00 out of 1.00

Flag question

State whether TRUE or FALSE.

$$For\ any\ two\ expressions\ E\ and\ F,\ E \leftrightarrow_\beta F\ if\ E \rightarrow_\beta F\ AND\ F \rightarrow_\beta E$$

Select one:

- True

False ✓

The correct answer is 'False'.

Question 9

Correct

Mark 1.00 out of 1.00

Flag question

Consider

$$((\lambda(x : \gamma).(\underline{\phi}\ x)\ )z\ )\ \underline{\sigma}$$

where ϕ is a constant of type $\gamma \to \gamma \to \gamma$, $\underline{\sigma}$ is a constant of type $\gamma \to \gamma$ and z is of type γ.

What is the type of the above expression? Do not assume any types

Select one:

- γ → γ → γ
- γ → γ → (γ → γ)
- cannot be determined ✓
-

γ

Your answer is correct.

The correct answer is: cannot be determined

Question 10

Correct

Mark 1.00 out of 1.00

Flag question

Let ϕ be a constant of type θ → θ → θ and true be of type θ:

```
λ(func1 : θ → Char). λ(τ : θ). func1 (τ φ true)
```

What is the type of the above expression? Do not assume any types.

Select one:

- `θ → Char → (θ → Char)` ✓
- `char`
- `θ → Char → Char`

θ → Char

Your answer is correct.

The correct answer is:

θ → Char → (θ → Char)

Question 11

Correct

Mark 1.00 out of 1.00

Flag question

Consider the following expression.

$$\lambda(\omega : A \to l).\ \lambda(x : A).\ \lambda(y : A).\ \omega\ (\ x \underline{\div} y\ )$$

Let $\underline{\div}$ be a constant of type $A \to A \to A$.

What is the type of the above expression? Do not assume any types

Select one:

(A → l) → (A → (A → l))

(A → l) → l

(A → 1) → (A → 1)

(A → 1)

Your answer is correct.

The correct answer is:

(A → 1) → (A → (A → 1))

Question 12

Incorrect

Mark 0.00 out of 1.00

Flag question

Types of p and r are $monad$ and ord respectively

$\lambda(k : (monad \rightarrow ord) + (ord \rightarrow ord)).\ case\ k\ of$

$M : monad \rightarrow ord\ then\ (\ (\lambda(p : monad).\ M)\ p\ )\ r\ ||$

$\tau : ord \rightarrow ord\ then\ (\lambda(r : ord).\ \tau\ (\tau\ (\tau\ r)))\ r$

What is the type of the above expression? Do not assume any types

Select one:

- (monad → ord) → (ord → ord)
- ord ✗
- Type cannot be determined for τ
- Type cannot be determined for M

Your answer is incorrect.

The correct answer is: Type cannot be determined for M

Finish review

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Finish review

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