

## Quiz 2: Abstract Syntax Tree

EN.601.426/626 Principles of Programming Languages – SP26

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

1. Suppose we have the following abstract syntax of  $\lambda$ -expressions in OCaml:

```
type lambda_expr = Var of string
                  | App of lambda_expr * lambda_expr
                  | Lam of string * lambda_expr
```

Write out the abstract syntax tree (in OCaml syntax) for the following  $\lambda$ -expressions:

- $(\lambda x.x) y$
  
- $(\lambda x.\lambda y.x y) a b$

2. Suppose we have the following abstract syntax of types in OCaml:

```
type typ = TVar of string      -- base type (int)
          | TParam of string  -- parameter ('a, 'b)
          | TArrow of typ * typ -- function type (T -> T)
```

Write out the abstract syntax tree for the type `'a -> int -> 'a`:

Please infer the most general type of the  $\lambda$ -expression  $(\lambda x.\lambda y.x y)$ .

Please write out the above answer using the abstract syntax defined above.