विश्वजीवनामृतं ज्ञानम्

Atal Bihari Vajpayee Indian Institute of Information Technology and Management Gwalior

Paradigms of Programming Languages

(CS-205-III Sem)

Mid Term Examination, Date: Sep 26, 2024

Timing: 4 to 6 PM Name: AKSHITA Roll No: 2023BCS065 Max marks: 30

Please write your Name and Roll Number in the question paper too. Write the corresponding question numbers to your answers correctly. Keep your code solutions syntactically and semantically correct and aligned to the questions to get full marks.

1. Answer the following questions.

(a) Suppose that we have defined let add x y = x + y. Which of the following produces an integer, which produces a function, and which produces an error?.

- add 5 1
- add 5
- (add 5) 1
- add (5 1)

(b) What are the structural and physical inequality operators in ocaml.

(c) What is the type of the following expression/function:

(i) "CS" ^string of int 3110

(ii) 7 * (1+2+3)

(d) Write an OCaml expression with the following type: int list list $->$ int list

(e) Compare dynamically typed and statically typed languages.

(f) Compare the contributions of Alan Turing, Alonso Church and Godel.

(g) Give the inference rules for let expression.

(h) What is the type of the following expression/function:

```
let rec func (f, l1, l2) = match l1 with
|[] -> []
|(h1::t1) -> match l2 with
|[] -> [f h1]
|(h2::t2) -> [f h1; f h2]
```

(i) What is the output value of the following ocaml expressions? If any error occurs, please describe the same:
let x = 1 in let x = x+1 in let x = x+1 in x;;
(j) Write a polymorphic OCaml function.

(10*2=20)

2. Write a function depth : 'a tree $->$ int that returns the number of nodes in any longest path from the root to a leaf. For example, the depth of an empty tree (simply Leaf) is 0, and the depth of tree t above is 3. Hint: there is a library function max : 'a $->$ 'a $->$ 'a that returns the maximum of any two values of the same type. **(5)**

3. Write a function powerset : *int list* $->$ *int list list* that takes a set S represented as a list and returns the set of all subsets of S. The order of subsets in the powerset and the order of elements in the subsets do not matter.

(5)

—-Best wishes—-