Amrita School of Computing, Coimbatore-641112

Department of Computer Science and Engineering

23CSE212 PRINCIPLES OF FUNCTIONAL LANGUAGES

Lab Evaluation-1 (Pattern Matching [CO1] and Recursion using lists [CO4])

Date: 30.12.2024 **Time: 1 hour**

Class: II B.Tech CSE – C and D **Maximum: 20 Marks**

Course Outcomes

CO1	Apply functional programming principles while designing solutions to problems and developing functional programs.
CO2	Formulate generic abstractions with higher order procedures while solving problems.
CO3	Formulate abstractions with data especially using lists and infinite data structures like streams.
CO4	Apply functional programming principles while developing solutions in contemporary languages.

Rubrics for Evaluation:

Question 1 – 10 Marks				**Question 2 – 10 Marks**			
Signature	**Pattern Matching**	**Logic**	**Output**	**Signature**	**Pattern Matching**	**Recursion**	**Output**
2	2	4	2	2	2	4	2

- Signature – No – 0; Partial Correct – 1; Full Correct – 2.
- Pattern Matching – 0/1/2
- Logic – 0/1/2 + 0/1/2
- Output – 0/1/2 - No output/Partial Output is correct/Correct Output for all cases.

Timings: 11:15 am to 12:15 pm – Implementation and Submission on ftp

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SET 1

1. Write a program in Haskell using "**Guards, Pattern matching**" and **taking three parameters from the user namely previous reading, current reading and unpaid balance** and computes a customer's water bill. The bill includes Rs. 50 water demand charge plus a consumption (use) charge of Rs.10 for every thousand litres used. Consumption is figured from meter readings (in thousands of litres) taken recently and at the end of the previous quarter. If the customer's unpaid balance exceeds zero, Rs. 2 late charge is assessed. Subtract an incentive of 1% of the total payment from the amount paid as an incentive. The maximum Incentive is limited to Rs. 100.00/-. Consumers with unpaid balance > 0 are not eligible for incentive
2. Define a Haskell function that takes a natural number n as input and tests the **Collatz - conjecture** for n. A **Collatz- conjecture** takes any positive integer as input and each term is obtained from the previous term as follows: if the previous term is even, the next term is half of the previous term. If the previous term is odd, the next term is 3 times the previous term plus 1. The conjecture is such that no matter what value of *n*, the sequence will always reach 1 as shown in the examples below: **[10] [CO3-BTL3-DL2]**

   (Collatz-conjecture 3) returns Output : 3, 10, 5, 16, 8, 4, 2, 1

SET 2

1. Write a program in Haskell using "**Guards, Pattern matching**" which **takes two arguments years and price from the user** , computes the depreciation value as per the table given below and displays the original price of the car, depreciated value and the amount to be paid.

No. of years used	Rate of depreciation (in %)
1	10
2	20
3	30
4	50
> 4	60

2. Write a procedure named **running-total** that takes a non-empty list of numbers as an argument and returns another list that contains the running total which is computed as follows:

   The first number in the resulting list should be the first number of the argument list, the second number in the resulting list should be the sum of the first and second numbers of the original list and the third number in the resulting list should be the sum of the first, second, and third numbers of the original list, and so on.

For example:
> (running-total '(1 2 3 4)) returns '(1 3 6 10)
> (running-total '(-5 0 –22 18 55)) returns '(-5 –5 –27 –9 46)

SET 3

1. Write a Haskell program using "pattern matching and guards" tocalculate the total rental tariff for an Airbnb booking. The rental tariff is based on the number of days and the type of room booked. Additionally, a 10% Goods and Services Tax (GST) needs to be applied to the final bill. The specific requirements are as follows:

   Room Types: The AirBnB offers different types of rooms, such as:

   a. **Standard Room**: 1500 INR per night
   b. **Deluxe Room**: 2500 INR per night
   c. **Suite**: 6000 INR per night

   Booking Duration: The price will depend on the number of days the room is booked for.
   GST Application: A GST of 10% should be added to the total room tariff after calculating the base cost.
   Final Bill Calculation:

   d. **Base Cost** = (Room Type Rate) * (Number of Days)
   e. **GST** = 10% of Base Cost
   f. **Final Bill** = Base Cost + GST

2. Define a Haskell function that generates the **digital root sequence** of a number n. The digital root is obtained by summing the digits of the number repeatedly until a single digit is obtained.
   For example `(digitalRootSequence 9876)` returns Output: 9876, 30, 3.