

Computer Science and Engineering Department, SVNIT - Surat
End Semester Examination - December - 2021
B.Tech IV – VII Semester
Principles of Programming Languages (CO405)

Date: 1st December 2021

Time: 9:30 AM to 12:30 PM

Max Marks: 50

Instructions:

1. Write your Admission No/Roll No and other details clearly on the answer books.
2. Write your Admission No on the question paper.
3. Be precise and clear in answering the questions.
4. Support your answer with necessary diagrams and examples.

Q1 Answer the following questions:

A. For the following Prolog program.

(04)

w(11).

w(22).

catch1(X) :- w(X), fail; w(X).

catch1(X) :- w(X).

catch2(X) :- w(X), !, fail; w(X).

catch2(X) :- w(X).

catch3(X) :- !, w(X), fail; w(X).

catch3(X) :- w(X).

catch4(X) :- !, (w(X), fail; w(X)).

catch4(X) :- w(X).

- I. Give all possible answers to the query *catch1(X)*, in the order that Prolog would produce them.
- II. Give all possible answers to the query *catch2(X)*, in the order that prolog would produce them.
- III. Give all possible answers to the query *catch3(X)*, in the order that prolog would produce them.
- IV. Give all possible answers to the query *catch4(X)*, in the order that prolog would produce them.

B. Write a complete PROLOG program using the predicate: *add_all(P,Q)*

(03)

i.e. for a given list of integers P, it returns a list Q of integers, such that each element in Q is the sum of all elements in P upto the same positions.

add_all([1,3],Q)

Q = [1,4]

add_all([1,2,3,4],Q)

Q = [1,3,6,10]

add_all([1,],Q)

Q = [1]

- C. Define with justification following relation in PROLOG: (03)

flatten(List, Flatlist)

where List can be a list of lists, and Flatlist is List ,flattened' so that the elements of List's sublists (or sub-sublists) are reorganized as one plain list. For example:

?- flatten([a,b,[c,d],[[e]],f], L).

L = [a,b,c,d,e,f]

- D. Write a PROLOG Program which separates strings of the odd length and even length in different files *odd.txt* and *even.txt* respectively. Take a list of strings as input from the user. (03)

- E. Consider the following Prolog program. (02)

q([], Q, Q).

q([A|L], S, SL) :- A > 5, !, q(L, [A|S], SL).

q([A|L], S, SL) :- q(L, S, SL).

Show all the answers generated by Prolog for the following goal:

q([2, 5, 7, 9, 6], [], Result).

- F. Write a complete PROLOG program using the predicate: (03)

remove2nd(List, NewList) that asserts that NewList is the same as a List except that the second top-level item is removed.

e.g.

remove2nd([a, b, c], [a, c]) returns true/yes

remove2nd([a, b], X) returns *X = [a]*

remove2nd([a], X) returns *X = [a]*

- G. A knowledge base contains the following statements: (03)

Everyone who loves all animals is loved by someone.

Anyone who kills an animal is loved by no one.

Jack loves all animals.

Either Jack or Curiosity killed Tuna, the cat.

- I. Convert these statements into FOL.
- II. Convert each FOL statement to CNF.
- III. Using resolution, prove that Curiosity killed the cat.

- H. Convert to predicate logic and also eliminate implications: (03)

- I. Anyone passing his history exams and winning the lottery is happy.
- II. But anyone who studies or is lucky can pass all his exams.
- III. John did not study, but John is lucky.

- I. Explain *modes ponens* and *substitution* operation for Logic Programming along with examples. Is Propositional Logic better than Predicate Logic? Justify. (03)

Q2 Answer the following questions:

- A. Find errors(if any) in following C++ statements: (03)

- I. `char *cp = vp; // vp is a void pointer`
- II. `int code = three; // three is an enumerator`
- III. `enum (green, yellow, red);`
- IV. `int const sp = total;`
- V. `const int array_size;`
- VI. `for (i=1; int i<10; i++) cout << i << "\n";`

- B. What are the characteristics of *co-routine*? List the languages which allow co-routines. (03)

- C. Define a class ***String*** that could work as a user-defined string type. Include constructors that will enable us to create an uninitialized string (04)

String s1; // string with length 0

and also initialize an object with a string constant at the time of creation like

String s2("Well done!");

Include a function that adds two strings to make a third string. Note that the statement

s2 = s1;

will be a perfectly reasonable expression to copy one string to another.

Write a complete program in C++ to test your class to see that it does the following tasks:

- I. Creates uninitialized string objects.
- II. Creates objects with string constants.
- III. Concatenates two strings properly.
- IV. Displays a desired string object.

- D. An educational institution wishes to maintain a database of its employees. The database is divided into a number of classes whose hierarchical relationships are shown in the following data. The data also shows the minimum information required for each class. Using C++ specify all classes and define functions to create the database and retrieve individual information as and when required. (04)

staff(code, name) —> teacher(subject, publication), typist(speed), officer(grade)

typist(speed) —> regular, casual (daily wages)

- E. What is the need of an activation record in implementing a subprogram? Explain with an example. (03)

- F. Write an interactive, menu-driven program that will access the file created in (04) following form and implement the tasks:

John 23456

Ahmed 9876.

.....

- I. Determine the telephone number of the specified person.
- II. Determine the name if a telephone number is known.
- III. Update the telephone number, whenever there is a change.

- G. State which of the following function definitions are illegal.

(02)

- I. `template<class A, B>`
`void fun(A, B)`
`{.....};`
- II. `template<class A, class A>`
`void fun(A, A)`
`{.....};`
- III. `template<class A>`
`void fun(A, A)`
`{.....};`
- IV. `template<class T, typename R>`
`T fun(T, R)`
`{.....};`
