

[This question paper contains 6 printed pages.]

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Your Roll No.....

B.Sc. (H) Computer Science / IV Sem. B

Paper 403 : PROGRAMMING PARADIGMS

(Admissions of 2001 to 2010)

Time : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately  
on receipt of this question paper.)

Attempt all questions.

Parts of a question must be answered together.

SECTION A (35 marks)

(All questions in this section are compulsory.)

1. (a) Define rule based languages with an example. (2)
- (b) Illustrate the variety of bindings and binding times for the following statement.  
$$Y = Y * 5$$
 (3)
- (c) Explain the analysis stages of translation of a source program. Give lexemes for the following expression.  
$$A = B + 6.0$$
 (5)

P.T.O.

2. (a) Features in C++ allow the same meaning to be expressed in many ways. How many different statements can you write in C++ that add 1 to a variable X (i.e. equivalent to  $X = X + 1$ )? List one advantage and one disadvantage of this aspect in the design of C++. (2)
- (b) Prove  $(\text{not } T) = F$  and  $(\text{not } F) = T$  using lambda calculus, where not is defined as  $\text{not} = \lambda x.((x F) T)$ . (3)
- (c) Explain any two methods for implementing character strings in a programming language? (3)
- (d) Define any one abstraction concept with an example. (2)
3. (a) Give a unifier for the following relations in prolog. Also, mention the substitutions needed for it.
- $$p(X, f(Y), a) = p(a, f(a), Y) \quad (4)$$
- (b) What will be the output of the following program if Y is transmitted to fn - (i) by reference and (ii) by value-result
- ```
void main(...)  
{ int Y;  
  fn( int X)
```

```
{ X = X + 1;
  cout<<X<<Y;
}
Y = 1;
fn(Y);
cout<<Y;
}
```

 (2)

(c) Give a Context Free Grammar describing the syntax for the following :-

“Sequence of letters or digits starting with a letter”. i.e. a1, abc, a6778, hhjf8 are acceptable but not 1hj, 477f etc. (4)

4. (a) Write a Prolog program to delete an element from list. (3)

(b) What will be the result of the following functions when performed on the given lists in LISP?

L1 = (1 3 7 5 6) and L2 = (1 6 8 9 0)

(i) (car (cdr (cdr L1)))

(ii) (\* L1 L2)

(iii) (cons L1 L2)

(iv) (cadr L2)

(2)

**SECTION B (40 marks)**

*(Attempt any four questions out of the following six.)*

5. Consider the following code in Prolog

```
max(X, Y, X) :- X >= Y, !.
```

```
max(X, Y, Y).
```

- (a) Provide an appropriate query to show that the above program can give incorrect result. (2)
- (b) Explain the cause of error. (2)
- (c) Suggest a correction for the above. (2)
- (d) Write a prolog program to find maximum of a list of numbers. (4)
6. (a) Consider the following code in prolog :

```
a(1).
```

```
a(2).
```

```
b(a).
```

```
c(A,B,C) :- a(A), d(B,C).
```

```
c(A,B,C) :- b(A), d(B,C).
```

```
d(B,C) :- a(B), !, a(C).
```

```
d(B,_) :- b(B).
```

Give all solutions, in order, for the query `c(X,Y,Z)`.  
& give the bindings. (4)

- (b) Explain any two problems in evaluating the tree representation of expressions. (4)
- (c) How are direct access files different from index sequential files. (2)
7. (a) Show the structure of activation record when the function FUNC(4,8.0) is executed :
- ```
float FUNC(int X, float Y)
{ const z = 10;
  #define maxval = 20;
  int k; char a[5];
  k = maxval;
  if(N>z) return (2*z + k);
}
```
- (6)
- (b) Discuss the advantages and disadvantages of dynamic type checking over static type checking. (4)
8. (a) Give the access formula for computing the location of component A[I,J] of a matrix A declared as
- ```
A: array[LB1..UB1, LB2..UB2]
```
- Where A is stored in column major order. (5)
- (b) What is garbage collection? (2)



(c) Write a program in Prolog to reverse a given list.

For eg. `reverse([a,b,c], Q) => instantiates Q to [c,b,a]` (3)

9. (a) How are records implemented in a language? Explain with a suitable example. (6)

(b) Write a prolog program to delete all occurrences of an element from a list. For eg. deleting a from `[c,d,a,a,r,a,g,a]` gives the result as `[c,d,r,g]`. (4)

10. (a) Differentiate between the following:

(i) Direct and indirect encapsulation.

(ii) Type conversion and type coercion. (6)

(b) What is strong typing? Explain using an appropriate example. (4)