BITS Pilani, Dubai Campus. International Academic City, Dubai

III Year First Semester 2013-2014

Degree: B.E.(Hons.). Branch: C.S.

Comprehensive Examination Question Paper

Course No : CS F301 Course Title: Principles of Programming Languages

Date: 31/12/2013 Tuesday Time: 12.30 p.m.- 3.30 p.m.

Total marks: 40 Weightage: 40%

Data provided are complete. ***Closed Book***.

This question paper has 2 pages.

Answer **all** Questions

1. Give a comparison between compiler and interpreter based on Flexibility and Efficiency. [2 M]
2. Distinguish between a Strong and Weak Type System. [2 M]
3. Draw a Syntax Chart for the following EBNF grammar: [2 M]

<expression> ::= <term> { (+|-) <term> }

4. Distinguish between Single Inheritance and Multiple Inheritance in OOP. [2 M]
5. Write a brief technical note on each of the following Exceptions with examples:
a) Traps b) Faults [2 +2 M]
6. Compare Traditional Recursion and Tail Recursion. [2 M]

7. What is the purpose of the following functions relating to Non Local Jumps:- [2 M]
a) **setjmp()**

b) **longjmp()**

8. Explain Threads using JAVA with an example code. [5 M]

9. Discuss *Deadlock* and *Livelock* situations w.r.t. *Dining Philosopher's* problem. [4 M]

10. Write a SWI-PROLOG program to
a) store the following information in a *machine database*.

Machine Id	**Machine Name**
m001	lathe
m002	milling m/c
m003	turning m/c
m004	cnc m/c
m005	smithy
m006	carpentary

b) List all the records. [3+2=5 M]

P.T.O.

11. Write the OUTPUT of the following C Program: [5 M]

```
#include <stdio.h>
main ()
{
  void e (int *xx, int nn, int *yy);
  int x = 20, i, n = 21, y = 0;
  for (i = 0; i < 20; i += 1)
    {
      e (&x, n, &y);
      printf ("y = %d\n", y);
      x = y;
    }
}
void
e (int *xx, int nn, int *yy)
{
  int z;
  z = ((nn * *xx) + 3) % 100;
  *yy = z;
}
```

12. Consider the following PICO LISP Program:

```
/* r1.l  */

(de my (n)
  (
  cond ( (or (= n 0) (= n 1) (= n 2) ) (- (+ (* 7 n n) (* 16 n)) 16 )
)
    ( t (+ (- (* 2 (my (- n 1))) (my (- n 2) ) ) (* 2 (my (- n 3))) ) )
   )
 )
/* ---------------------------------------- */
```

Write the **result (output)** of each of the following LISP Expressions for the above code: [5 M]

INPUT	OUTPUT
(my 0)	?
(my 2)	?
(my 4)	?
(my 6)	?
(my 8)	?

----------END----------

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III Year FIRST SEMESTER 2013-2014

Degree: B.E. (Hons.) C.S.

TEST II Question Paper

Course No : CS F301 Course Title: Principles of Programming Languages

Date: 11, Dec., 2013 Wednesday Time: 50 min. Total marks: 20

Data provided are complete. **OPEN *Book*.**

Text Books / REFERENCE BOOK and class notes permitted.

This question paper has two pages.

Answer all Questions.

1. Write a SWI-PROLOG program to implement the following RECURRENCE RELATION; Assume that *n* is >= *0*.

T(n) =

- **$2n^2 + 3n + 1$**, for n=0,1 or 2
- **3T(n-1) + 2T(n-2) + T(n-3)** for n > 2.

Write the output for the following queries/goals:

i) **t(3,X).** ii). **t(4,Y).** [4+2 M]

2. Consider the following PICO LISP Program:

```
  /* comm.l  */
( de comm(n  k)
     (  cond  ( ( =  n  k )  1  )
              ( ( =  k  0 )  1  )
           (  t ( +  ( comm( - n 1) (- k 1)  )
                     (  comm( - n  1 ) k )
             )
           )
     )
 )              /* ---------------------------------------- */
```

Write the **result (output)** of each of the following LISP Expressions for the above code:

INPUT	OUTPUT
(comm 6 2)	?
(comm 5 4)	?

[3 M]

P.T.O.

3. Write a PICO LISP program to implement the following RECURRENCE RELATION: (Assume that n is >= 0).

T(n) =

- $\mathbf{2n^2 + 3n + 1}$, for n=0,1.
- **3T(n-1) + 2T(n-2)** for n > 1. [4 M]

4. Represent the given below LIST (shown in bold) using any one method;

TREE representation

OR

BOX and ARROW notation,

w.r.t functional programming language PICO LISP.

((AGATE) (CORAL) (DIAMOND EMERALD) (LAPIS PEARL) (RUBY SAPHIRE) (TOPAZ))

[4 M]

5. *Write a SWI-PROLOG program* that calculates a **power of two**.

A *sample execution* scenario (after successful compilation of your program) is shown below:

?- power(4,Power). (This is the input typed by you)
Power = 16 (since 2 * 2 * 2 * 2 = 16. This is the output of your program)

?- power(5,Power). (This is the input typed by you)
Power = 32 (since 2 * 2 * 2 * 2*2 = 32. This is the output of your program)

[3 M]

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FIRST SEMESTER 2013-2014

Degree: B.E. (Hons.)

TEST I Question Paper

Course No : CS F301 Course Title: Principles of Programming Languages

Date: 07/10/2013 Wednesday Time: 50 min. Total marks: 25

Data provided are complete. **Closed *Book*.**

This question paper has **two** pages.

Answer all Questions.

1. What are the factors effecting READABILITY and WRITEABILITY for a higher level programming language? [4 M]

2. **Write** the **PROOF RULE** for partial correctness in standard form for each of the following statement types. **Give an example** in each category. [4 M]

a) Statement Composition
b) Conditional

3. Consider the following context free grammar (CFG) :

$S \rightarrow \mathbf{a}B \mid \mathbf{b}A$
$A \rightarrow \mathbf{a}S \mid \mathbf{b}AA \mid \mathbf{a}$
$B \rightarrow \mathbf{b}S \mid \mathbf{a}BB \mid \mathbf{b}$

You are given an input string as follows:

aaabbabbba

For the above input string, Find the **leftmost derivation** and its corresponding **parse tree**. [3+3=6 M]

4. PRE-FIX NOTATION, POSTFIX NOTATION and ABSTRACT SYNTAX TREE

Consider the expression given below. Treat **sqrt** as an operator with one argument.

(m/2 + sqrt((m/2) *(m/4) - p*q)) / p

A) Write the above expression using PREFIX Notation.

B) Write the above expression using POSTFIX Notation.

C) Draw the AST for the above expression. [3*2=6]

P.T.O.

5. Parameter Passing: Write the OUTPUT of the following C Program: [5 M]

```
#include <stdio.h>
main ()
{
  void e (int xx, int *nn, int j);
  int x[5], i;
  int y[5];
  int n = 7;
  for (i = 4; i >= 0; i -= 1)
    {
      x[i] = 1 + (2 * n);
      y[4 - i] = 2 * x[i] + 3;
      e (x[i], &n, y[4 - i]);
    }
}
void
e (int xx, int *nn, int j)
{
  int m, z;
  m = *nn + 1;
  z = xx + 1;
  *nn = (*nn * 2) + 1;
  printf (" m = %d z= %d j = %d \n", m, z, j);
}
```

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III Year First Semester 2013-2014
Degree: B.E. Hons. Branch: C.S.
QUIZ I (SET B)
Course No : CS F301 Course Title: Principles of Programming Languages
Date: 23, Oct., 2013 Wednesday Time: 20 min. Total marks: 08
Weightage: 8% Venue : 336 ***Closed Book***.
This question paper has 2 pages [back to back]
IDNO: Name:

Write answers in the space provided in question paper. Answer all questions.
Note:_____ means one or more words to be filled within a line. 8*1=8 M

1.Can you add an integer quantity to a pointer variable (say Yes or No) _____

2. What is the meaning of the following declaration? **int p(char *a[]);**

3. How is an UNION different from a STRUCTURE in C Language?

4. What is COERCION ?

[P.T.O. after finishing this page]

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Course No : CS F301 Course Title: Principles of Programming Languages
Date: 23, Oct., 2013 Wednesday Time: 20 min. Total marks: 08
Weightage: 8% Venue : 336 ***Closed Book.***
This question paper has 2 pages [back to back]
IDNO: Name:

5. Define a suitable STRUCTURE in C to store the following information for 10 students: IDNO, NAME, ADDRESS, DATE OF BIRTH, CGPA

6. Write an example for Enumeration (Enumerated Type) w.r.t. any one programming language (like C or C++ or Java or Pascal).

7. C functions can accept arrays of different sizes. (Say True or false.) _____

8. The components of a Record have names and are called _____.

ROUGH WORK ONLY in this space