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Printed Pages--4

CS--505

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 1007**

Roll No.

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**B.Tech.**

FIFTH SEMESTER EXAMINATION, 2005-2006

**PRINCIPLES OF PROGRAMMING LANGUAGES**

Time : 3 Hours

Total Marks : 100

**TH**

- Note :** (i) Attempt **ALL** questions.  
(ii) You may answer using any programming language  
(iii) Be precise in your answer.

1. Write short notes on **any four** : (5x4)
- Characteristics of a programming language
  - Various phases of compiler
  - Virtual Computer
  - Issues in design of an object oriented language
  - Software simulated computer
  - Program verification

2. Attempt **any two** of the following : (10x2)

- (a) Consider the following implementation of a set of strings. This implementation uses two arrays - start and pool. The array pool stores the strings and the array start keeps indices where these strings are stored. So for storing strings "Tex", "Troff" and "Word", the implementation looks like

start	0	3	8	12	
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pool	T	e	x	T	r	o	f	f	W	o	r	d
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How would you

- (i) Compute length of k-th string in pool.
  - (ii) Determine if i-th and k-th strings are same.
- (b) What is a pointer ? Explain the terms "dereferencing" and "deallocation" in this reference. Also explain merits and disadvantages of using pointers in a program.
- (c) Write a program to implement an abstract data type "Complex". This data type implements a complex number  $a+ib$ . Also write methods to determine magnitude and conjugate of this complex number.

3. Attempt *any two* of the following : (10x2)

- (a) The readers-and-writers problem is as follows. A reader reads a resource without changing it. A writer changes the resource. Ensure that multiple readers can simultaneously read a resource but that each writer has exclusive access to the resource at any time.  
Use semaphores to solve the problem.
- (b) Nonlocal referencing for a language with dynamic scope rules can be implemented via a table that keeps tracks of the referencable nonlocal variables. Detail the implementation of such a table and actions that must be executed at subprogram entry and exit in order to keep this table upto date.

- (c) Write short notes on :
- (i) Exception handling
  - (ii) Call by reference method of parameter passing

4. Attempt *any two* of the following (10x2)

- (a) What is a heap ? Explain how heap can be used to implement storage management. In this context explain the most suitable data structure to implement heap such that garbage collection and removal of dangling references is carried out efficiently.
- (b) What is BNF grammar notation to define syntax of a grammar ? Using this notation write rules for syntax of a "do.. while" statement and "if.. else" statement.
- (c) Write regular expressions for :
- (i) 'C' constant
  - (ii) decimals divisible by 3 and 4
  - (iii) Binary strings beginning and ending with 10
  - (iv) Binary strings with at most one zero

5. Attempt *any two* of the following : (10x2)

- (a) Write a recursive formulation for determining if a number  $n$  is prime. You can use any functional language to write this function. Using your answer show evaluation steps for  $n=15$ .

- (b) What is a data flow language ? What are its advantages with respect to an imperative language ? Also discuss limitations of such languages.
- (c) Write notes on :
- (i) Functional programming
  - (ii) Lambda calculus

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