

(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, 2004-2005

PRINCIPLES OF PROGRAMMING LANGUAGES

Time : 3 Hours

Total Marks : 100

Note : Attempt *ALL* the questions. Every question carries 20 marks. Marks of parts of every question are given against it. Make suitable assumptions wherever necessary.

1. Attempt *any four* parts of the following : (5×4=20)

- (a) Briefly discuss major characteristics of a good programming language.
- (b) Give structure of a typical languages implementation, and discuss what are Firmware and Virtual Computers.
- (c) On the basis of execution time and storage requirements, compare the compiler and interpreter.
- (d) Draw the block diagram of the structure of compiler and discuss its various phases in brief.

- (e) Consider the following statement of a programming language and discuss various kinds of binding and binding times associated with its components.

Abs(x) = if (x < y + 5) then go to xx ;

- (f) What are the major factors that affect development and evolution of programming languages methodologies.

2. Attempt *any four* parts of the following : [5×4=20]

- (a) What are the main criteria for implementation of an operation in hardware, software (subprogram) and in-line sequence ?

- (b) Making suitable assumptions and with full justification, derive accessing formula for an element $A[I_1, I_2, \dots, I_n]$ in an array A declared as :

A: array $[I_1..u_1, I_2..u_2, \dots, I_n..U_n]$ of integer;

- (c) What are part Arrays and Variant Records ? How they differ from the conventional arrays and records ?

- (d) Give the complete syntax for operation specification. What are major methods for their implementation ?

- (e) Give three examples each for :
- (i) System defined data object.
 - (ii) User defined heterogeneous data object.
 - (iii) Define abstraction, encapsulation, and polymorphism giving example.
- (f) Discuss sequential and index sequential files with their specification and implementation.

3. Attempt *any two* parts of the following : (10×2=20)

- (a) Consider the following Procedure :

Procedure Swap (x, y: integer);

var t: integer;

Begin

t = x;

x := y;

y := t;

end;

Suppose $i=1$. $a[1]=2$ and $a[2]=3$. Giving proper justification find out the values of i , $a[1]$, and $a[2]$ on completion of the call $\text{swap}(a[i], i)$ if

- (i) x and y are passed by value.
- (ii) x is passed by value and y is passed by reference.
- (iii) x and y are passed by reference.
- (iv) x and y are passed by name.

(b) (i) Consider the following syntactically correct program :

(3+3=6)

program P (----)

var x, y: integer;

procedure Q;

var x: integer

begin

x:=25;

write (x, y);

call R;

x:=x+y;

write(x);

end;

procedure R;

var y, z: integer;

begin

y:=40;

z:=x+y;

write (x, y, z);

end;

begin

x:=50;

y:=30;

call Q;

write(x, y);

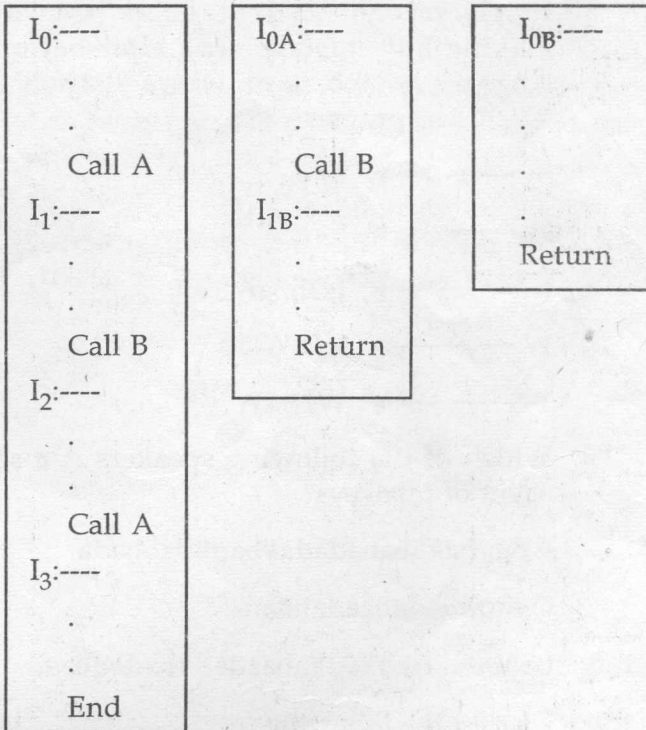
end.

With proper justification give output of the program if the language follows :

(a) Static scope rules.

(b) Dynamic scope rules.

- (ii) What are co-routines? Discuss their implementation. [4]
- (c) Implementation of subprogram call and return normally requires concept of Current Instruction Pointer (CIP) and Current Environment Pointer (CEP). Consider the following code segments for the main program and subprogram A and B



Giving complete details of CIP and CEP at each Call and Return discuss static and dynamic implementation of simple subprogram Call and Return sequence. Please note that static allocation of code and referencing environment does not require CEP.

4. Attempt *any two* parts of the following : [10×2=20]

(a) Discuss the following :

(i) Stack and Heap Based Storage Management.

(ii) Garbage Collection.

(b) The syntax of a monkey language is quite simple, yet only monkeys can speak it without making any mistake. The alphabet of the language is {a, b, d, #}, where # stands for a space. The grammar is :

S → b/d

P → Sa

L → I/IS/aI/aS

W → L/LWL

T → W/S#W

Which of the following speakers is a secret agent of monkeys?

Ape: ba#ababadada#bad#dabbada

Cimp: abdabaadab#ada

Babbon: dad#ad#abaadad#badadbaad

(c) Discuss the following [4+3+3=1

(i) Recursive subprogram implementation.

(ii) Ambiguous grammar.

(iii) Run-time requirements of a programming language.

5. Attempt *any two* parts of the following : [10×2=20]

- (a) Compare the languages like C, Pascal, LISP on the basis of the following :
- (i) Program Structure
 - (ii) Parameter Passing Scheme
 - (iii) Scope Rules
 - (iv) Control Structure Available
 - (v) Data object/type available
- (b) Clearly differentiate between Data Flow Languages and Object Oriented Languages, giving suitable examples.
- (c) Give syntax and semantics of Lambda Calculus. Show that LISP functions can be written as Lambda abstractions.

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