BITS, PILANI – DUBAI CAMPUS
KNOWLEDGE VILLAGE, DUBAI
II Year, First Semester 2005 – 2006
COMPUTER PROGRAMMING II TA UC 252
Comprehensive Examination (Closed Book)

Time : 3 hours **Weightage : 40%**
03.01.06 **MAX : 40 MARKS**

Instructions

1. **Answer all the questions. This paper contains 15 questions in 3 sections.**
2. **Answer all questions and subsections sequentially.**
3. **Answer Section-A in main answer booklet and Sections B and C in two separate additional booklets and mark them clearly with the section names.**

SECTION - A

1. **Note:** In all parts of this question you have to write only the functions or declarations that are asked and **NOT** a complete program.

   (a) A singly linked linear list is required to store a sequence of **floating point numbers**. Write a **declaration** for nodes of such a list. **(0.5 mark)**

   (b) Write a function that accepts as its parameters a floating point number and a node pointer, then **creates a node** of the type declared in part(a) with these fields and returns a pointer to the node created. **(1.5 mark)**

   (c) Write a function that accepts a floating point number x and a node pointer p as its parameters, creates a new node containing the value x using the function you created in part(b), and **inserts** this node after the node pointed by p. You can assume that p is not NULL and points to a node of the type declared in part(a) of a linked list. **(1.0 mark)**

   (d) Write a function that accepts a pointer p to a node of the type declared in part (a) and **deletes** the node that comes after the node pointed by p. **(1.0 mark)**

   (e) Write a function that accepts a pointer to the first node of the type declared in part (a) of a list and **displays** all elements of the list with one item per line. **(1.0 mark)**

2. (a) Draw the diagrams of a doubly linked linear list and a singly linked circular list containing the characters of the string "BPDC" with one character per node in the order in which they appear in the string. **(1.0 mark)**

   (b) Push and pop operations are performed on stack of characters as follows. When push operations are performed, characters of the input string "**SPOT**" are added to the stack one-by-one in the order they appear in the input string. When pop operations are performed, characters poped out of the stack are appended to an output string which is initially empty. Give the sequence of push and pop operations that will create the output string "**OPTS**" **(1.0 mark)**

3. The following numbers are inserted in that order into an empty binary search tree.
   44, 88, 17, 65, 32, 97, 82, 54, 28, 76, 29, 80.
   (a) Draw the final binary search tree T. **(1.5 marks)**
   (b) How many comparisons will be made in searching for 85 in T? **(0.5 mark)**
   (c) What is the height of T? What is the level of the node 29 in T? **(0.5 mark)**
   (d) Do preorder, inorder, and postorder traversals of T. **(1.5 marks)**

4. Write recursive and nonrecursive versions of binary search algorithm. Compare the advantages and disadvantages of these two versions. **(3 marks)**

SECTION - B

5. How does the w+ mode differ from w mode? **(1 mark)**

6. Distinguish between the following functions giving the syntax for each
   a) printf and fprintf
   b) getc and getch **(2X1 = 2 marks)**

7. Give true or false and explain
   a. Any operation can be performed on the file without the use of the file pointer.
   b. Only integer variables are used to test for EOF
   c. It is an error to access a file with its name rather than its file pointer.
   d. A file can be accessed without opening it. **(0.5 X 4 = 2 marks)**

8. Fill in the blanks
   a. A _____ can be used to create a synonym for a previously defined data type
   b. The name of the structure is referred to as the _____
   c. The _____ is the name given to a collection of data items in which the data items share different memory locations
   d. A struct type in C is a _____ data type
   e. In accessing a member of a structure using a pointer p the following two notations can be used _____ and _____.
   f. The instruction *ptr++ increments the _____ while ++*ptr increments the _____.

   (4 marks)

9. Write a program using structures to compute the value of the expression $y = x^n$ where both x and n are integer values and are declared as members of a structure.
   (2 marks)

10. Give the output of the following program.

```
# include<stdio.h>
main( )
{
    int v = 3;
    int * pv;

   pv = & v;
   printf("\n *pv = %d    v = %d", *pv,v);
   *pv = 0;
   printf("\n *pv = %d    v = %d", *pv,v);
}
```

(2 marks)

SECTION - C

11. Fill in the blanks **(6 * 1 = 6 marks)**

a. The insulation of the data from direct access by the program is called _____
b. In OOPS, the concept of _____ provides the idea of reusability.
c. _____ is an OOP concept which allows objects to have different internal structures to share the same external interface.
d. To perform linear search on an ordered set of nine elements the average number of comparisons is _____
e. An algorithm in which the dominant mechanism is executed cn^4 times for c, a constant and n the problem size is said to have a _____ complexity.
f. To sort an array of 10 elements using selection sort method the number of comparisons is _____.

12. Which version of the program is a good programming practice? (1 mark)

version a

```
while (year < 2005)
```

version b

```
n = 2005
while (year < n)
```

13. Modify the program to make it efficient. (1 mark)

```
x =0;
for(i=1;i<10;i++)
{
    x = x +1;
    y = (((b*b) – (4*a*c))/ (2 * a)) * x;
}
```

where a, b, c are constants.

14.a. Build the hash table for the given array using mod 19, indicating collisions
20,22,30,33,37,40,41,49,52,54,55,57,63,67,70 (2 marks)

b. Find the total number of steps needed to locate all the elements in the given array? (0.5 mark)

c. In how many steps can you search the element 52 in the array? (0.5 mark)

15. Write a program to sort using selection sort and search an element using binary search. (2 marks)

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II Year, First Semester 2005 – 2006

COMPUTER PROGRAMMING II – TAUC252

TEST – II (Open Book)

Duration : 50 minutes
27.11.05

Weightage : 20%
MAX : 20 MARKS

1. A singly linked linear list stores a sequence of **floating point numbers**. Write a function that returns the sum of the numbers stored in the list. Pass only a pointer to the first node of the list as an argument to this function. **(3 Marks)**

2. What is the value returned by the following function which takes as its argument a pointer to the first node of a singly linked linear list?

```
int magic(struct node *list)
{
  if (list = = NULL) return 0;
  return (1+magic(list->next);
}
```

(1 Mark)

3. Write a function that accepts a list of integers and creates two lists of which one contains the negative numbers and the other contains the nonnegative (positive and zero) numbers in the given list. **(4 Marks)**

4. Trace the detailed working of the shell sort and the bubble sort for the following numbers.

   34, 77, 1, 89, 25, 67, 55, 19

   (2+2 Marks)

5. Answer the following :

a) The number of passes required in bubble sort to sort an array of size 19 is -----
b) The number of comparisons required to sort an array of size n using selection sort is_____

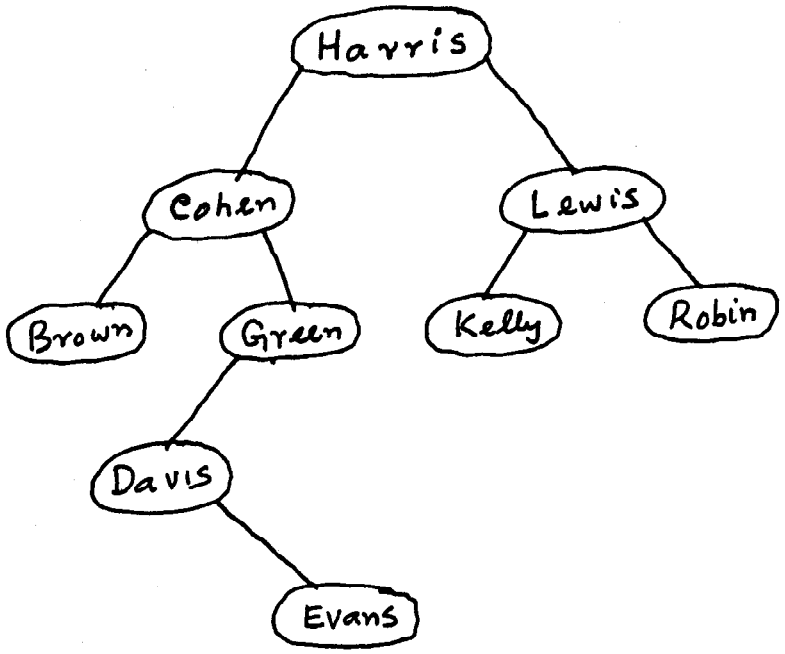
(0.5 X 2) = 1 mark

6. Construct a binary search tree for the given input list. **(1 mark)**
   23, 15, 6, 9, 11, 7, 31, 26, 27, 19, 14, 12, 3, 29, 36
   Based on the tree answer the following questions

   a. depth of the tree is _____ **(0.5 mark)**
   b. level of node 9 is _____ **(0.5 mark)**
   c. _____ node is the sibling of node 36 **(0.5 mark)**

7. Write a program that uses a stack to determine if a string is a palindrome. **(3 marks)**

8. Write the inorder, preorder and postorder traversals of the given tree **(1.5 marks)**



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Computer Prograaming II TAUC252 Quiz(Closed book)

Duration : 30 Mins Max marks : 10 Weightage : 10% Date : 19-10-05

VERSION A

Note : Mark only one answer **clearly** on the question paper itself. Answers not marked clearly **will not be evaluated.**
All questions carry equal marks (1/2)

1. What is the purpose for which a file is opened by the following statement?
   fp = fopen("data", "a");
   A. Reading
   B. Writing
   C. Adding more data at the end of the file.
   D. For reading and writing

2. Which of the following is correct syntax for putc(), where c is a character and fp is a file pointer?
   A. putc(fp, c);
   B. fp = putc(c);
   C. c = putc(fp);
   D. putc(c, fp);

3. What type of data is read by getw() function?
   A. Character
   B. Integer
   C. Floating point numbers
   D. Strings

4. Which input function can read more than one data item at a time?
   A. fscanf()
   B. getc()
   C. getw()
   D. None of these

5. Which of the following is correct?
   A. &230
   B. &(x+y)
   C. int a[20]; &a
   D. int b[10]; &b[5]

6. An array name represents a ------ ----- the first location of the array.

7. A pointer can never be subtracted from another. TRUE or FALSE?
8. Which of the following accesses a variable in structure b?
   A. b->var;
   B. b.var;
   C. b-var;
   D. b>var;
9. Which of the following accesses a variable in structure *b?
   A. b->var;
   B. b.var;
   C. b-var;
   D. b>var;
10. Which of the following is a properly defined struct?
   A. struct {int a;}
   B. struct a_struct {int a;}
   C. struct a_struct int a;
   D. struct a_struct {int a;};
11. Which properly declares a variable of struct foo?
   A. struct foo;
   B. struct foo var;
   C. foo;
   D. int foo;

12. If you insert the numbers (in order) 5, 7, and 2 into a queue, which element is deleted first?
   A.5
   B.7
   C.2

13. Which uses less memory ?

   A. struct astruct
   {
   int x;
   float y;
   int v;
   };
   B. union aunion
   {
   int x;
   float v;
   };
   C. char array[10];

14. If you insert numbers in the following order 1,3,4,8,5 into a stack, which number is popped out first?

   A. 5 B. 4 C. 3 D. 1

15. Function _____ is used to reclaim dynamically allocated memory.

16. _____ is a specialized version of a linked list in which nodes can be inserted and deleted only from the start of the list.

17. A queue is referred to as a _____ data structure because the first nodes inserted are the first node removed.

18. Which of the following is correct syntax for malloc() ?
    A. s = malloc(size(struct node));
    B. s = malloc(sizeof(struct node));
    C. s = malloc(struct node);

19. The final node in the Linked list points to _____ value.

20. _____ is an application of stack.

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Computer Prograaming II TAUC252 Test 1(Closed Book)

Duration : 50 Mins Max marks : 20 Weightage : 20% Date : 9-10-05

NOTE : Answer questions in serial order only. Questions answered out of series will not be evaluated.

1. A disk file DATA contains a set of integers. Write a program to read this file and count the number of negative, zero, and positive values in the file and write this information to a file RESULTS in the following format.
   Number of negative numbers =
   Number of zeros =
   Number of positive numbers =
   (4 Marks)

2. (a) What is the significance of EOF? (1 Mark)
   (b) Distinguish between printf and fprintf. (1 Mark)

3. Given the following statements give the output.

Variable name	Address	Contents
p	2568	425
q	4284	2568
r	6242	4284
a[0]	8468	232
a[10]	8488	2568

a) *(&q)
b) &(*r)
c) **r
d) *p
e) a[0]

(0.5 X 5 = 2.5 Marks)

4. Give the difference between a null pointer, an ASCII null character and a null string.
   (0.5 X 3 = 1.5 Marks)

5. State true or false

a) A struct type in C is a built in data type.

b) A tag name of a structure is optional

c) A structure cannot have a union as one of its members.

d) The keyword typedef is used to define a new data type. (0.5 X 4 = 2 Marks)

6. Explain the following terms

a) Nested structures

b) Array of structures (1 X 2 = 2 Marks)

7. (a) Fill in the blanks (1 mark)

A _____ is a collection of variables under one name in which the variables share the same storage.

(a) True or false. Explain why (1 mark)

Structures may not be compared by using operators == and !=

8. Define a structure for student to store details name, age, CGPA, department using 7 bits for name, 2 bits for age,4 bits for CGPA,3 bits for department. (1 mark)

9. What will be the output of the following program (1 mark)

```
struct gospel
{
 int num;
 char message1[50];
 char message2[50];
}
m1 = {2, "If you are driven by success", "make sure it is a quality drive"};

main()
{
 struct gospel m2,m3;

 m2 = m1;
 m3 = m2;

 printf("\n%d%s%s",m1.num,m2.message1,m3.message2);
}
```

10. Point out errors, if any in the following program (1 mark)

```
main()
{
   struct employee
   {
      char name[25];
      int age;
      float bs;
   };
   struct employee e;
   strcpy(e.name, "Smith");
   age = 25;
   printf("\n%s%d",e.name,age);
}
```

11. Program (2 marks)

Define a structure called **student** that will describe the following information

idno
name
dept
year
cgpa

a. Using student, declare an array **stud** with 10 elements and write a program to read the information about 10 students and print a departmentwise list containing names of students with their cgpa. (1 mark)

b. Use a function called **modify** to change the cgpa of a student by passing structure as a parameter to function. (1 mark)

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Computer Prograaming II TAUC252 Test 1(Closed Book)

Duration : 50 Mins Max marks : 20 Weightage : 20% Date : 9-10-05

MAKE UP PAPER

NOTE : Answer questions in serial order only. Questions answered out of series will not be evaluated.

1. Explain the significance of the statement **k with a diagram showing address locations - 1 mark

2. Consider the given program

```
main()
{
        float a;=7.999999;
        float *b,*c;
        b=&a;
        c=b;
        printf("\n%u%u%u",&a,b);
        printf("\n%d%d%d",a,*(&a),*b,*c);
}
```

Give the output of the program, indicate the addresses you have assumed clearly.
– 3 marks

3. When do you use the following
a) Unions
b) Bit fields
c) sizeof operator - 3 marks

4. Fill in the blanks (1 mark)

a. A structure member is accessed with either the _____ operator or the _____ operator. (1/2 + ½)

b. True or false. Explain why (1 mark)

Address of a structure variable can be passed to a function.

c. Choose the correct answer (1 mark)

Given the statement

maruti.engine.bolts = 25;

Which of the following is true?

1. structure bolts is nested within structure engine
2. structure engine is nested within structure maruti
3. structure maruti is nested within structure engine
4. structure maruti is nested within structure bolts

d. What will be the output of the following program (1 mark)

```
main()
{
 struct
 {
   int num;
   float f;
   char message[50];
 } m;

m.num = 1;
m.f = 3.14;

strcpy(m.message, "God is great");
printf("\n%d%f%s",m.num,m.f,m.message);
```

e. Point out errors, if any in the following program (1 mark)

```
main()
{
  struct
  {
     char name[25];
     char language[10];
  };
  struct employee e = {"John",C");
  printf("\n%s%d",e.name, e.language);
}
```