

Course Number & Title : TA UC252 – Computer Programming – II
Component Name : Comprehensive Examination (Closed Book)
Weightage : 40 %
Duration : 3 hours
Date & Day : 18-12-2006, Monday
Max. Marks : 40 Marks

Note:-1. Answer all questions.

2. Answer all questions sequentially; questions answered out of sequence will **not be evaluated**.
3. Read the instructions from the cover page of the main answer book.
4. **Answer section A and B in the Main answer book and Section C & D in the separate additional answer book.**

Section A

A. State whether the following are true or false.

($\frac{1}{4} * 8 = 2$ Marks)

1. The storage organization of structure members and array elements are different.
2. Two structures of the same type can be compared.
3. A structure cannot have a union as one of its members.
4. Pointers can be used to return multiple values from a function via function arguments.
5. We can make the same pointer to point to different data variables of same type in different statements of a C program.
6. We can use scanf() to read values of bit fields.
7. When an array is passed as an argument to a function, a pointer is passed.
8. All files must be explicitly closed.

B. Fill in the following blanks.

($\frac{1}{4} * 8 = 2$ Marks)

1. A _____ is a collection of data items of different types under one name, in which the items share the same storage.
2. The value of a string type structure member can be assigned to a member of another structure of the same type using _____.
3. The _____ is used to create a synonym for a previously defined data type.
4. The two ways to access the members of a structure are using _____ and _____ operators.
{ Note: 0.25 marks will be awarded to the above question only if both answers are correct }
5. Pointers are used to implement a method of a function call known as _____.
6. The _____ operator is used with a pointer to de-reference the address contained in the pointer.
7. _____ is the equivalent pointer expression for referring the element a[i][j][k].
8. When an existing file is opened in _____ mode, its contents are deleted.

C. Find the output of the following C program segments

($\frac{1}{2} * 3 = 1.5$ Marks)

```
1. #include<stdio.h>
   main()
   {
       int i=4, j=2;
```

```

    junk(&i,j);
    printf("\n%d \t %d",i,j);
}
junk(int *i, int j)
{
    *i = *i * *i;
    j = j * j;
}

```

2. #include<stdio.h>
main()
{
 int a[] = {2,4,6,8,10};
 int i;
 change(a,5);
 for(i=0;i<=4;i++)
 printf("\n%d",a[i]);
}

```

change(int *b,int n)
{
    int i;
    for(i=0;i<n;i++)
        *(b+i) = *(b+i) +5;
}

```

3. #include<stdio.h>
main()
{
 float a[] = {13.24,1.5,1.5,5.4,3.5};
 float *j;
 j=a;
 j=j + 4;
 printf("%d \t %d",*j,a[4]);
}

D. a) Add the missing statement in correct place for the program to print 35.

```

#include<stdio.h>
main()
{
    int j, *ptr;
    *ptr = 35;
    printf("\n %d",j);
}

```

(¼ Marks)

b) If int s[5] is a 1 D-al array of integers, which of the following refers to the 3rd element in the array

1. *(s + 2)
2. *(s + 3)

(¼ marks)

E. Identify the error(s) in the following program segments and give suitable explanation for each with the error corrected .

($\frac{1}{2}$ * 4 = 2 Marks)

1.

```
#include<stdio.h>
main()
{
    int a[] = {10,20,30,40};
    int j;
    j = a;
    j = j + 3;
    printf("\n %d",*j);
}
```
2.

```
#include<stdio.h>
main()
{
    int max = 5;
    float arr[max];
    for(i=0;i<max;i++)
        scanf("%f",&arr[i]);
}
```
3.

```
#include<stdio.h>
main()
{
    int fp;
    fp = fopen("pr20.c","r")
    if (fp == -1)
        puts("cannot open file");
    else
        close(fp);
}
```
4.

```
#include<stdio.h>
main()
{
    struct employee
    {
        char name[25];
        int age;
    };
    struct employee e;
    strcpy(e.name,"Hacker");
    age = 25;
    printf("\n %s %d",e.name,age);
}
```

F. Write a C program which calls a function (using a pointer parameter) that reverses the elements of a given 1 D-al array

(3 Marks)

Section B

1. Fill in the following blanks:

- a) A technique for algorithm design that tries to accommodate the human limitation is known as _____ (6 * ½ = 3 Mark)
b) _____ or _____.
c) If an algorithm has been properly designed the path of execution should flow in a straight line from _____ to _____.
d) Efficiency considerations for algorithms are inherently tied in with the _____ and _____ of algorithms.
e) Most of the inefficiencies that creep into the implementation of algorithms come about because _____ and _____ is used.
f) A function that calls itself either directly or indirectly is a _____ function.

2. What are the two approaches available for writing a repetitive algorithm? (½ Mark)
3. Write an algorithm to solve the factorial problem recursively. (1 Mark)
4. Consider the following algorithm: (2 ½ Marks)

```
Fun1(x <integer>)  
  If (x<5)  
    Return (3 * x)  
  Else  
    Return (2*Fun1(x-5) +7)  
End Fun1.
```

Show the stepwise execution of the above algorithm that would be return if Fun1 is called as

- a) Fun1(4)
b) Fun1(10)
c) Fun1(12)
5. Flowcharting and pseudo code are two different design tools for an algorithm. How do they differ and how are they similar? (1 Mark)

Section – C

1. Construct a binary search tree for the given input list (½ Mark)
21,16, 5, 8, 10, 6, 34, 28, 26, 18, 13, 12, 2, 29, 39
Based on the tree answer the following questions
a. For the above created tree iterate over the nodes to print them out in increasing order. (½ Mark)
b. Write the postorder traversal of the right subtree. (½ Mark)
c. Write the preorder traversal of the left subtree. (½ Mark)
d. Fill in the blanks (4 * ¼ = 1 Mark)
i) The depth of the tree is _____.
ii) The inorder successor of node 18 is _____.
iii) The sibling of node 6 is _____.
iv) The level of node 8 is _____.
2. Given a nonempty binary search tree, write a program in C to return the minimum data value found in that tree. (2 Mark)

3. Build the hash table for the given array using mod 19, indicating collisions. (½ Mark)
11, 13, 21, 24, 31, 32, 43, 45, 46, 50, 54, 58, 61
 - a. Find the total number of steps needed to locate all the elements in the given array. (½ Mark)
 - b. In how many steps can you search the element 45 in the array. (½ Mark)
 - c. Find the average number of steps needed to locate an element. (½ Mark)
4. Trace the detailed working of bubble sort for the following numbers. (1 Mark)
1, 9, 2, 8, 3, 7, 4, 6, 5
What is the drawback of bubble sort algorithm? (½ Mark)
5. Write a program in C for merging three arrays. (1 ½ Mark)

Section – D

1. i) A Linked List contains two fields a) a string b) a pointer to the next component. Write a menu driven **program** to allow a user to perform the following operations
 a) Create a linked list by adding data elements to the end of the linked list. The last node of the linked list is denoted by a node whose data part contains the string "END" and the pointer part contains NULL
 b) To display all the elements of the linked list except the node which contains the data element "END"
 ii) Write both the **functions** for the above program in a recursive manner. (2 + 1 Marks)
2. Diagrammatically show the difference between (1 Mark)
 - (a) a linear linked list and a circular linked list
 - (b) a linear linked list and a doubly linked list
3. Fill in the blanks: (each ¼ Mark)
 - (a) The pointer of a linear linked list always point to the _____
 - (b) A queue is a _____ while a stack is a _____ data structure.
 - (c) A _____ identifies the last logical node in a linked list.
 - (d) A _____ function is used to dynamically allocate memory to arrays.
 - (e) The _____ instruction is used to change the size of the memory space assigned dynamically
4. Give the difference between the calloc and the malloc instructions with reference to
a) function b) syntax (1 + 1 Marks)
5. a. Create a queue using both dynamic memory allocation as well as static memory allocation.
 b. Which would be a better technique for maintaining a queue, specify why?
 (1 ½ + 1 ½ + ½ Marks)

**BITS, PILANI – DUBAI CAMPUS
KNOWLEDGE VILLAGE, DUBAI**

II Year, First Semester 2005 – 2006

COMPUTER PROGRAMMING II – TAUC252

**Make up
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 integers. Write a function that will delete all nodes containing zero values. Pass only a pointer to the first node of the list as an argument to this function and the function should return the modified list.
(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?

```
struct node *magic(struct node *list)
{
    if (list == NULL) return NULL;
    while (list->next!=NULL) list = list->next;
    return list;
}
```

(1 Mark)

3. Write a function that accepts two list of integers and returns the list obtained by appending the second list to the first list.
(4 Marks)
4. Display the working of the selection sort and insertion sort for the following sequence of characters.

G E T H O M S N

(4 Marks)

5. The number of comparisons required to sort an array given in descending order to an array in ascending order by using the following techniques are

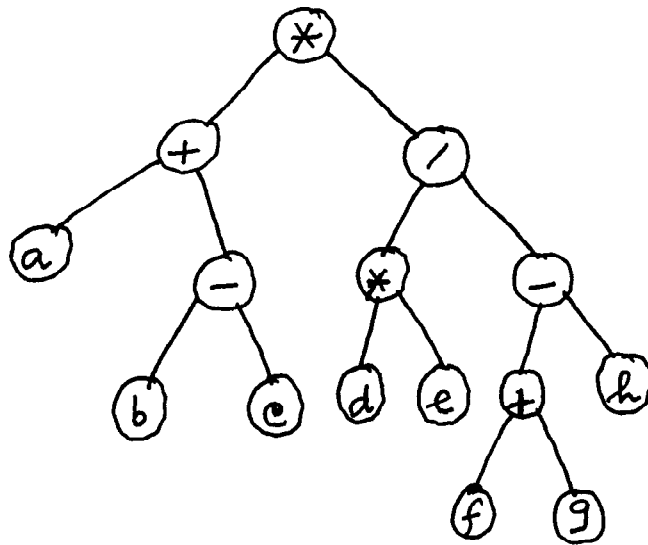
- i) Bubble sort
- ii) Selection sort

(0.5X2=1 Mark)

6. Construct a binary search tree for the given input list. (1 mark)
15, 10, 18, 13, 12, 23, 17, 27, 5, 22, 29.

Based on the tree answer the following questions.

- Parent of node 22 is _____ (0.5 mark)
 - Left child of node 13 is _____ (0.5 mark)
 - State true or false: 12 is the leaf node (0.5 mark)
7. Write a program that inputs a line of text and uses a stack to print the line reversed. (3 marks)
8. Write the inorder, preorder and postorder traversals of the given tree (1.5 marks)



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Course Number & Title : TA UC252 – Computer Programming – II
Component Name : Test – II (Open Book)
Weightage : 20 %
Duration : 50 minutes
Date & Day : 26-11-2006, Sunday

Note:-1. Answer all questions.

2. Answer all questions sequentially; questions answered out of sequence will **not be evaluated**.

3. Read the instructions from the cover page of the main answer book.

4. Text Book (ANSII C by Balagurusamy) and Class Notes are allowed.

Section – A

1. Identify the output of the following program

(½ Mark)

```
#include <stdio.h>
main()
{
    struct node
    {
        int data;
        struct node *next;
    };
    struct node *p,*q;

    p = malloc(sizeof(struct node));
    q = malloc(sizeof(struct node));

    p->data = 10;
    q->data = 20;
    p->next = q;
    q->next = p;

    while( p!= NULL)
    {
        printf("\n%d",p->data);
        p = p->next;
    }
}
```

2. Identify the output of the following program

(½ Mark)

```
#include <stdio.h>
main()
{
    struct node
    {
        struct node *previous;
        int data;
    };
}
```



```

    struct node *next;
};
struct node *p,*q;

p = malloc(sizeof(struct node));
q = malloc(sizeof(struct node));

p->data = 75;
q->data = 90;
p->previous = NULL;
p->next = q;
q->previous = p;
q->next = NULL;

while( p!= NULL)
{
    printf("\n%d",p->data);
    p = p->next;
}
}

```

3. Write a C program to find the largest of a set of N integer numbers using **dynamic memory allocation**. (2 Marks)

4. Assume each digit of a number is stored in consecutive 2 bytes of memory. Use **dynamic memory allocation** and write a C program which

- * reads the number of digits of the input number (0.25 Mark)
- * reads each digit of the number and stores them in consecutive memory bytes. (0.5 Mark)
- * checks whether the number is a palindrome or not and outputs whether the number is a palindrome or not accordingly. (1.25 Marks)

Note: If the input number is same as its reversed form then it is a palindrome.

Ex:

1221 is a palindrome

1231 is not a palindrome.

5. Write a C function/ functions for each of the following

- a. Delete a node with the minimum value from a single linked list. (1Mark)
- b. Delete all occurrences of a specified data element X in a single linked list. (1Mark)
- c. Erase all contents of a linked list. (½ Mark)

6. A structure contains fields like

- a. Name
- b. Street
- c. Zip Code
- d. Acc_no
- e. Acc status (S for saving , C for current)

i) Give the structure declaration to represent this information as a circular doubly linked list. (1Mark)

ii) Diagrammatically represent a circular doubly linked list for three customers (1Mark)

iii) What is the benefit of using a doubly linked list over a single linked list. (½ Mark)

Section – B

1. A line of text is read from the input terminal into a stack. Write a C program using linked list to output the string in the reverse order, each character appearing twice.
(Eg: the string **p i l a n i** should be changed to **i i n n a a l l i i p p**) 2M
2. Consider the following sequence of digits
B, I, T, S
These are supposed to be operated through a stack to produce the following sequence of digits
I, B, S, T
List the push and pop operations to get the desired output 1M
3. Give the necessary declaration of a linked list implemented queue containing float type elements. Also write a user defined function in C to delete a float type number from the queue. 1M
4. For a circular queue called Q with 6 memory locations of floating type. Illustrate each stage of Q after each of the following operations 1M
 - a. 35.5 is inserted
 - b. 7.2 is inserted
 - c. 8.4 is inserted
 - d. A delete operation is done
 - e. 93.24 is inserted
 - f. A delete operation is done
 - g. A delete operation is done
 - h. 52.5 is inserted

Section – C

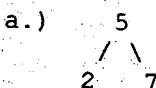
1. For each node in a binary search tree, create a new duplicate node, and insert the duplicate as the left child of the original node. The resulting tree should still be a binary search tree.

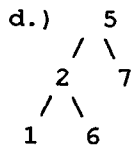
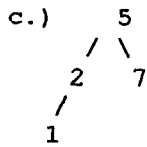
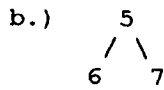
So the tree...

(1 ½ Mark)



2. Given a plain binary tree, examine the tree to determine if it meets the requirement to be a binary search tree. Consider the following four examples given below and state whether it is binary search tree or not, and justify your answers. (marks will be awarded based on the justification given, only) (¼ Mark each)





3. The following are the inorder and postorder traversal of a single binary tree whose nodes are labeled as 0, 1, 2, ..., 9. (2 Marks)

inorder: 4 1 5 6 2 0 8 3 9 7

postorder: 4 6 5 2 1 8 9 7 3 0

- a) Draw the corresponding Binary tree T with the nodes labeled.
 - b) Using the above given inorder and postorder traversal output, give the following:
 - i) List out the set of nodes in the left subtree of the Tree T.
 - ii) Give the inorder traversal of the right subtree of T.
 - iii) Give the postorder traversal of the left subtree of T.
4. Create a binary tree using the following input values as nodes:

Input values are: 19, -1, 5, 9, 3, -5, 11, 21, 6

(1 Mark)

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BITS, Pilani – Dubai Campus
Knowledge Village, Dubai
First Semester 2006 – 07

Nos. of Question: 16
Nos. of Sections : A, B, C

Course Number & Title : **TA UC252 – Computer Programming – II**
Weightage : 20 %
Duration : 50 minutes
Date & Day : 15-10-2006, Sunday

Test-1 (Closed Book)

Note:-1. Answer all questions.

2. Answer the questions sequentially.

3. Read the instructions from the cover page of the main answer book.

Section – A

1. What will be the output of the following program?

(1 Mark)

```
main()
{
    struct student
    {
        char name[10];
        int age;
        int roll;
    };
    struct student stud = {"Arun",17,12};
    struct student stud1;
    stud1 = stud;
    stud1.roll = 18;
    printf("%s",stud1.name);
    printf("%d",stud1.roll);
    printf("%d",stud1.age);
    printf("%d",stud.roll);
}
```

2. Identify and correct the error in the following code fragment.

(1 Mark)

```
struct first
{
    int a;
    float b;
}s1;

struct second
{
    int a;
    float b;
}s2;
s1 = s2;
```

3. Develop a structure to store information about employees of an organization consisting of following data elements.

Data item	Type	Width
Code	char	6
Name	char	50
Dept	char	15
Join_date	date	8

Write a program to print the name of those employees who have completed at least one year of service.
(2 Marks)

4. Write a C program that will **create a structure** to store the following information for each team in a baseball or football league.

- Team name
- Number of wins
- Number of losses

For a baseball team add the following information

- Number of hits
- Number of runs
- Number of errors

For a football team add the following information

- Number of ties
- Number of goals
- Number of wins
- Number of fouls

Store this information in an array of structures, where each array element contains information for a single team. Make use of a union to represent the variable information (either baseball or football) that is included as part of the structure. The union itself should contain two structures, one for baseball related activities and the other for football related statistics.

(2 Marks)

5. Consider the following code in the specified line numbers

(½ Mark each)

```

1 struct employee
2 {
3     unsigned id : 5
4     unsigned age:3
5     unsigned : 2
6     char name[30]
7 } emp;
8 scanf("%d", &emp.id);
9     emp.age = 42;
```

- is the statement on line 5 valid, if so what is its function

- b) is the statement on line 6 valid, give reasons for yes or no
- c) is the statement on line 8 valid, give reasons for yes or no
- d) is the statement 9 valid, give reasons for yes or no

Section - B

1. The only integer constant that can be assigned to a pointer variable is _____. (1/2 Mark)
2. If m & n are declared as integers and p1 and p2 as pointers to integers, then state errors, if any,

Note : Answer should be ERROR or NO ERROR accordingly.

- a) *p1 = &n;
- b) m = p2 * p1;
- c) p1 = &p2;
- d) m = *p1 + *p2++;

(1/4 Mark each)

3. Given the following declarations:-

int x=10,y=10;

int *p1 = &x, *p2 = &y;

What is the value of each of the following expressions?

- a) (*p1)++
- b) --(*p2)
- c) *p1 + (*p2)--
- d) ++(*p2) - *p1

(1/4 Mark each)

4. Given the following declarations,

int a= 5, *ptr1;

char c, *ptr2;

Point out which of the following pointer initializations are legal and which are illegal.

Note : Answer should be LEGAL or ILLEGAL accordingly.

- a) ptr1 = &a;
- b) ptr1 = &25;
- c) ptr1 = &(a + 3);
- d) ptr2 = &'#';

(1/4 Mark each)

5. Write a C program to read and print an integer variable *i*, in terms of its pointer. (1 ½ Mark)
6. Write a C program to find the largest of two integers *a* and *b* using their respective pointers. (2 Marks)

Section - C

1. Write a single C statement to accomplish each of the following. Assume that each of these statements applies to the same program (1 ½ Marks)
 - a) Write a statement that opens file **"newmast.dat"** for writing (and creation) and assigns the returned file pointer to **nfptr**.
 - b) Write a statement that writes a record to the file **"newmast.dat"**. The record consists of integer **accountnum**, string **name**, and floating point **currentbalance**.
 - c) Write a statement that opens file **"oldmast.dat"** for reading and assigns the returned file pointer to **ofptr**.
2. On opening a file for reading which of the following activities are performed:
 - a) The disk is searched for existence of the file.
 - b) The file is brought into memory.
 - c) A pointer is set up which points to the first character in the file.
 - d) All of the above. (½ Marks)
3. Find the error in each of the following program segments. Explain how the error can be corrected. (1 Mark)
 - a) `open ("receive.dat", r+);`
 - b) The file **"tools.dat"** should be opened for appending without modifying the current contents of the file.
`if ((cfptr = fopen ("tools.dat", "w+")) != NULL);`
4. The ~~maere~~ FILE is defined in which of the following files: (½ Mark)
 - a) `stdlib.h` b) `stdio.c`, c) `math.h`, d) `stdio.h`
5. Write a C Program to Read records from a file containing the details of an employee like name, age, and basic salary using structure. (1 ½ Marks)
