Code.No: 09A1EC01 | R09 | SET-1

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
I B.TECH - REGULAR EXAMINATIONS, JUNE - 2010
C PROGRAMMING AND DATA STRUCTURES
(COMMON TO CE, EEE, ME, ECE, CSE, CHEM, EIE, BME, IT, MECT, E.COMP.E, MMT, MEP, AE, ICE, BT, AME)

Time: 3hours **Max.Marks:75**

Answer any FIVE questions
All questions carry equal marks

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1.a) Explain the functions of the following:
i) Preprocessor
ii) Compiler
iii) Linker.
b) Draw a flowchart to find maximum and minimum of the given three input numbers. [6+9]

2.a) Write minimal C-expressions for the following:
i) $3x^4 + 5x^3 - 4x^2 + 7x + 20$
ii) $\frac{a}{bc} - \frac{b}{ca} - \frac{c}{ab}$
iii) Digit at 100's place of the given integer *x*. (Ex. Digit at 100's place in 2578 is 5).
iv) If a > b then the value of expression is a-b, otherwise b-a
v) True if $5 < x < 10$, otherwise false
vi) Divide the integer variable x by 16 using bit-wise operators
b) What is the difference between the following c-words?
i) amount and "amount"
ii) 200 and 200.0
c) A number is said to be prime, if it is not exactly divisible by any other numbers other than 1 and the number it self. For example 7 and 11 are primes. Write C- language program that reads a number from input and determine whether it is a prime or not. [6+2+7]

3.a) Write a recursive function *double power(double x, int n)* that returns x^n. Write an equivalent iterative version. Compare them.
b) Using arrays and iteration, Write C-language program that outputs minimum number of currency notes required for the given amount at input. For example, an amount of Rs.4260 shall output 1000s – 4; 100s – 2; 50s -1; 10s-1. The currency denominations are 1000,500,100,50,20,10,5,2 and 1. [8+7]

4 a) Consider the following C-program.

```
void testfun(int *a, int  b)
b)   {
 int x=2;
 static int y=5;
 y=y+b;
 x=x+y;
 *a=x+y+b;
```

```
    b=b+ *a;
}
int main()
{
    int a=10,b=5,c=20,*x;
    x=&a;
    testfun(x,b);
    printf("%d  %d %d %d\n",a,b,c,*x);
    testfun(x,c);
    printf("%d %d %d %d\n",a,b,c,*x);
    }
```

Trace the above program execution (changed variable values and bindings of each statement during execution). What is the output of above program? [15]

5. Write C-structures for the College data. College contains the following fields: College code (2characters), College Name (dynamically allocated string), year of establishment, number of courses and courses(dynamically allocated structure). A College can offer 1 to 50 courses. Each course is associated with course name (String), duration, number of students. The number of students in the college is sum of number of students in all the courses in the college. Write a function *int collegeeStrength (struct College *c)* that returns the number of students in the college pointed by c. [15]

6.a) List and explain Streams functions of text files along with their prototypes.

b) Write C-program for finding the number of words in the given text file. Assume that the words are separated by one or more blanks. [7+8]

7.a) Write an algorithm or C-program for sorting integers in ascending order using insertion sort.

b) Demonstrate the insertion sort results for each insertion for the following initial array of elements.
25 6 15 12 8 34 9 18 2 [7+8]

8.a) What are the operations on Linear Lists? Differentiate between using Arrays and Linked Lists for implementation of Linear Lists.

b) Write Structure for implementing Linked List of integers. Write C-function for insertion operation in Linked List. [7+8]

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Time: 3hours **Max.Marks:75**

Answer any FIVE questions
All questions carry equal marks

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1.a) List out the various steps in software development.
b) Given the 3 sides of triangle a, b and c as input, Draw a flowchart to test whether it is isosceles, equilateral or not. It should also validate whether the input forms a triangle or not. (Ex. 10, 3, 3 is not a triangle) [6+9]

2.a) Write minimal C-expressions for the following:
i) $5a^4+3a^3-4a^2+6a+12$
ii) $\frac{a}{bc}-\frac{b}{ca}-\frac{c}{ab}$
iii) If the given integer value of x is treated as binary, the fifth bit from the right.
iv) Absolute value of variable x.
v) True if x is exactly divisible by 5 but not divisible by 3, otherwise false.
vi) Subtract x from y and then increment x.
b) What is the difference between the following C-words?
i) 253 and 0253
ii) 'r' and '\r'
c) Write C-program for determining whether the given integer at input is perfect number or not. A number is said to be perfect number if the sum of factors is equal to number itself. For example, the factors of 6 are 1, 2, 3 whose sum 1+2+3=6. [6+2+7]

3.a) Write recursive function *int gcd(int m, int n)* that returns greatest common divisor of m and n where m>n. Write an equivalent iterative version. Compare them. In order to find gcd, if m is exactly divisible by n, then n is the value of gcd, otherwise it is gcd of the n and the remainder of the division. For example. gcd(6,4)=gcd(4,2)=2
b) Write C-function *int minpos(float x[], int n)* that returns position of the first minimum value among the first n elements of the given array x. [8+7]

4. Consider the following program:

```
void funtest(int *a, int *b)
{
static int i=10;
int j=5;
j=j+a;
i=i+b;
*a=i;
*b=j;
}
int main()
```

```
{
int i=20,j=30, *x, *y;
x=&i;
y=&j;
funtest(x,y);
printf("%d %d %d %d\n",i,j,*x,*y);
funtest(x,y);
printf("%d %d %d %d\n",i,j,*x,*y);
}
```

Trace the above program execution (changed variable values and bindings of each statement during execution). What is the output of above program? [15]

5. Write C-structures for a country with the following fields: country Name(dynamically allocated string), currency code(3 letter string), number of states and states(dynamically allocated structures). A country can have 1 to 100 states. Each state is associated with name (dynamically allocated string), area, and population. The area of the country is the sum of the areas of all the states in the country. Similarly the population of the country is population of all states put together. Write function *void countrystats(struct country *c, int *a, int *b)*that computes the area and population of the country and places at locations pointed by a and b. [15]

6.a) List and explain the streams functions for binary files along with their prototypes.
b) Write a C-function that takes a binary file of long integers and appends a new long integer at the end that is sum of all integers in the original file. [7+8]

7.a) Write an algorithm or program for sorting integers using bubble sort.
b) Show the bubble sort results for each pass for the following initial array of elements.
35 18 7 12 5 23 16 3 1 [7+8]

8.a) Write an algorithm for evaluating postfix expression. Demonstrate your algorithm with stack contents for each operation using the post fix expression 2 3 5 + *
b) Write structures for Linked list implementation of Stack and a function for pop operation. [8+7]

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Time: 3hours **Max.Marks:75**

Answer any FIVE questions
All questions carry equal marks
- - -

1.a) What is an algorithm? List and explain the properties of algorithm.

b) A utility company charges its customers based on their monthly utilization in terms of units as follows:

Description	**charge**
First 100 units	Rs.10 per unit
Next 200 units	Rs. 9 per unit
Next 200 units	Rs.8 per unit
Next units	Rs.7 per unit

Write flowchart that reads monthly units of a customer and output the charge amount. [7+8]

2.a) Write minimal C- expressions for the following:

i) $6b^4+3b^3-5b^2+6b+15$

ii) $\frac{2a}{c}-\frac{3b}{a^2}-\frac{c}{4b}$

iii) Increment x and then add to z

iv) Maximum of the values of 3 variables a, b and c

v) True if the value of character variable c is in uppercase, otherwise false

vi) Rightmost octal digit in the value of integer variable x

b) What is the difference between the following C-words?
i) 5 and '5' ii) if and ++

c) Write C-program for generation of multiplication table for the given integer input x. For example, if input is 5, the program need to output

```
5 X 1 = 5
5 X 2 =10
  …..
5 X10 =50
```

[6+2+7]

3.a) Consider the following recursive function

```
int bbb(int n,int r)
{
printf("%d  %d\n",n,r);
if (r==0 || n==r)return 1;
else return bbb(n-1,r)+bbb(n-1,r-1);
}
```

What output is printed for the function call bbb (4,2)? What does the function do?

b) Write a C-program that reads the given n observations at input and computes average of n observations and find the number of observations above average value. The input is value of n followed by n observations. [8+7]

4.a) Consider the following C- program segment.

```
char*months[12]={“JANUARY”,”FEBRAURY”,”MARCH”,”APRIL”,
”MAY”,”JUNE”,”JULY”,”AUGUST”,”SEPTEMBER”,”OCTOBER”,”NOVEMB
ER”,”DECEMBER”};
char **a= months;
char **b = a++;
```

What are the values of the following expressions? Justify your answer.

i) **a ii) *(*(a+5)+3)

iii) *(a+7) iv) *(*(a+9)+6)==*(*a+11)+7)

v) *(++b) vi) *(b++ +3)

b) Write C-function *void exchange (int *x, int *y)* that exchange the values pointed by x and y. In addition the function requires counter that count the number of times the function is invoked. [6+9]

5. Write C-structures for line diagram. The Line diagram has the following fields: diagram Name (dynamically allocated string), no of lines, lines(dynamically allocated structure). The line diagram can have 1 to 500 lines. Each line contains two end points, line thickness in pixels and color in the following set (red, black, blue, green, yellow, orange). Each point contains X-coordinate and Y-coordinate in pixels. Using this structure, write a function *int countlines (struct line_diagram *l, int c)* that returns the number of lines in the given color c. [15]

6.a) List and explain different format literals available in printf statement.

b) Write C-language program that reads a C-program file and outputs number of lines in the program. [7+8]

7.a) Write an algorithm or C-function for selection sort for sorting an array of integer in ascending order.

b) Demonstrate the selection sort results for each pass for the following initial array of elements.

21 6 3 57 13 9 14 18 2 [7+8]

8.a) Write an algorithm that convert the given infix expression in to post fix. Demonstrate your algorithm using stack for the expression a + b*c

b) Write C-structures for implementing queues using Linked Lists. Using these structures, write C-function for dequeue operation. [7+8]

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Time: 3hours **Max.Marks:75**

Answer any FIVE questions
All questions carry equal marks
- - -

1.a) List and explain the functions of various parts of computer hardware.

b) A university gives grades based on the percentage of marks obtained in the examinations as follows:

Percentage of marks	**Grade**
70 and above	Distinction
60 and above but below 70	First
50 and above but below 60	Second
40 and above but below 50	Third
below 40	Fail

Write a flowchart that inputs the percentage marks and output the division. [6+9]

2.a) Write minimal C- expressions for the following:

i) $6a^4+3a^3-5a^2-6a+22$

ii) $\frac{1}{3}ab+\frac{2}{5}bc$

iii) Equivalent to C-statement while (a > = b)a = a-b where a and b are unsigned integers.

iv) True if x/y >3 without zero divide, false otherwise

v) If x<y then -1 else if x = = y then 0 else 1(use ternary operator)

vi) Fourth bit from the right if the number x is treated in binary representation.

b) What is the difference between the following C-words?
i) count and int ii) 526 and “526”

c) Write C-program that reverses the decimal digits of integer value at input. For example, for input 5379, the program need to output 9735. [6+2+7]

3.a) Consider the following recursive function

```
void toh( int n, char src, char dist, char inter)
{
if (n>0)
{
toh(n-1, src, inter, dist);
printf(“move %d from %s to %s\n”, n, src,dist);
toh(n-1,inter,dist,src);
}
}
```

What is the output printed by the above program for the function call toh (4,’A’,’B’,’C’)?

b) Write C-function *float max(float a[], int n)* that returns the maximum value of the first n positions of array a. [8+7]

4.a) Consider the following C-program segment.

```
int x[4][4]={{1,2,3,5},{4,5,6,8},{7,8,9,10}};
int **a=x;
int **b=a++;
```

what are values of the following C-expressions? Justify your answer.

i) **a ii)*(*(a+1)) iii) *(*a+1)+2)

iv)**b+5 v)*(*(b+1)+1)+1 vi)**(a+2)+7

b) Write C-function *void insert (char a[], char c, int *n, int i)* that inserts character c at index i in the array by shifting all elements above that position by 1 and incrementing n. [6+9]

5. Write C-structures for departmental store application. Each departmental store contains departmental store Id (3 characters), store location (dynamically allocated string), items (dynamically allocated structures) and number of items. A store can offer 1 to 1000 items. Each Item contains Item code (4 characters), current stock, unit of measure in the following set (Single, dozen, kilogram, liter, meter, square meter) and price. Using this structure, Write C- function to count the number of items whose price is above the given amount. [15]

6.a) Differentiate between fprintf and fwrite statements. When do you prefer to use fwrite instead of fprintf ?

b) Given filename, index and value, Write C-program that reads element of binary files of long integer array at the given index, add value to it and store back at that location. [7+8]

7.a) Write algorithm/Program for binary search to find the given element within array. For What data binary search is not applicable?

b) Show the quick sort results for each exchange for the following initial array of elements

35 54 12 18 23 15 45 38 [7+8]

8.a) Using recursive function for factorial, explain the execution of the function call factorial(5) using stack.

b) Write C-structure for implementing Stack using an array. Using this structure, write functions for push and pop operations. [7+8]

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