

SUMMER ASSIGNMENT (2016 batch)

Note: This assignment consist three parts. And all parts are compulsory:

Part 1- C programming

1. Write a program to alphabetize a customer list.
2. Write a program to perform multiplication and division of numbers with return value of function.
3. What will be the output of the following program segment, write with explanation:

```
main()
{
    int c[ ]={2,8,3,4,4,6,7,5};
    int j,*p=c,*q=c;
    for(j=0;j<5;j++)
    { printf(" %d ",*c);
      ++q; }
    for(j=0;j<5;j++){
    printf(" %d ",*p);
    ++p; }
}
```

4. What will the output/error of the following program segment :

```
main(){
char string[]="Hello World";
display(string);
}
void display(char *string)
{
printf("%s",string);
}
```

5. What will be the output of the following program segment:

```
#include<stdio.h>
main(){
char s[]={ 'a','b','c','\n','c','\0'};
char *p,*str,*str1;
p=&s[3];
str=p;
str1=s;
printf("%d",++*p + ++*str1-32);
}
```

6. What will be the output?

```
void main()
{ int array[]={1,2,3,4,5,6};
void xxx(int[5]);
xxx(arr);
getch();
}
void xxx(int ch[5])
{
clrscr();
printf("%d",1 [ch]);
}
```

7. Write a program:

In a town, the percentage of men is 48. The percentage of total literacy is 52. If total percentage of literate men is 25 of the total population, write a program to find the total number of illiterate men and women if the population of the town is user define.

8. If a 5-digit number is input through the keyboard, write a program to print a new number by adding one to first digit, two in second, three in third, four in fourth, five in fifth digit of number. For example if the number that is input is 11111 then the output should be displayed as 23456.
9. In a company, worker efficiency is determined on the basis of the time required for a worker to complete a particular job. If the time taken by the worker is between 2 & 3 hours, then the worker is said to be highly efficient. If the time required by the worker is between 3 & 4 hours, then the worker is ordered to improve speed. If the time taken is between 4 & 5 hours, the worker is given training to improve his speed, and if the time taken by the worker is more than 5 hours, then the worker has to leave the company. If the time taken by the worker is input through the keyboard, find the efficiency of the worker.
10. An Insurance company follows following rules to calculate premium. (1) If a person's health is excellent and the person is between 25 and 35 years of age and lives in a city and is a male then the premium is Rs. 4 per thousand and his policy amount cannot exceed Rs. 2 lakhs. (2) If a person satisfies all the above conditions except that the sex is female then the premium is Rs. 3 per thousand and her policy amount cannot exceed Rs. 1 lakh. (3) If a person's health is poor and the person is between 25 and 35 years of age and lives in a village and is a male then the premium is Rs. 6 per thousand and his policy cannot exceed Rs. 10,000. (4) In all other cases the person is not insured. Write a

program to output whether the person should be insured or not, his/her premium rate and maximum amount for which he/she can be insured.

Part 2- Data structure

1. A weight balanced tree is a binary tree in which for each node, the no. of nodes in the left sub tree is at least half and at most twice the no. of nodes in the right sub tree. The maximum possible height of such a tree with n nodes is best described by which of the following?

(a) $\log_2 n$ (b) $\log_{4/3} n$ (c) $\log_3 n$ (d) $\log_{3/2} n$

2. The function delete (head, element) is used to delete a node from the linked list by finding the node value with a given element. The parameter head is the first node of the list. Find the missing statements A and B in the following “delete” function to delete the node? (Assume all elements are distinct in the list and the function returns pointers that point to the first node of the list).

```
Node delete (Node head, int element)
{
    Node x = head;
    if (x.data == element) return head.next;
    while (x.next != NULL)
    {
        if ( A )
        {
            B ;
            return head;
        }
        x = x.next;
    }
}
```

(a) A:x.data==element
B:x.next==x.next.next

(b) A:x.next.data==element
B:x.next==x.next.next

(c) A:x.data==element
B:x.next.next==x.next

(d) A:x.next.data==element
B:x.next.next==x.next

3. Consider the following code

```
Node *find (Node * head)
{
    Node * P1 = head, *P2 = head;
    while (P2)
    {
        P1 = P1 → next;
        P2 = (P2 → next)? P2 → next → next : NULL;
```

```

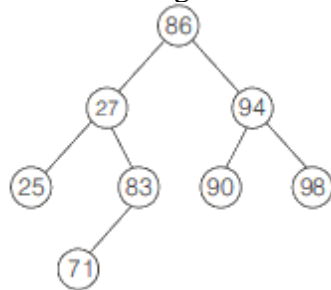
}
printf ("%d", P1 → value);
}

```

Assume Node is the structure type with two members: 'value' and 'next'. Identify the node value printed by the above code if non-empty linked list header is passed to the function find?

- First element of the list [i.e., value of the first node]
- Second element of the list
- Middle element of the list
- Last element of the list

4. Consider the following AVL tree.



Which of the following order of elements are inserted into an empty AVL tree, so that it is possible to get the above AVL tree?

- 94, 71, 86, 25, 98, 83, 27, 90
- 98, 94, 90, 83, 86, 25, 71, 94
- 86, 25, 98, 83, 27, 90, 71, 94
- None of these

5. Consider the following procedure struct.

```

gate (root)
{
if (root == null) return 0;
if (root → leftchild == null && root → rightchild == null) return 1;
else return (maximum (gate(root → leftchild), gate(root → rightchild)) + 1);
}

```

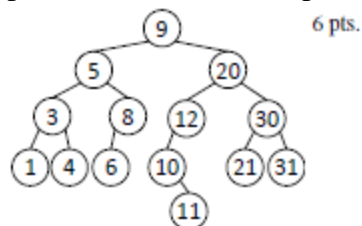
Explain the functionality of above function?

6. Construct a balanced binary max-heap (i.e. a heap that always returns the maximum element) using the following elements, pushing them onto the heap in the given order:

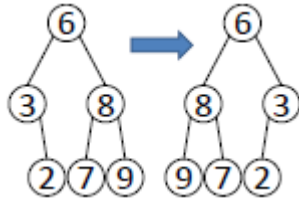
7, 2, 1, 9, 12, 3, 14

Draw the heap after each completed insertion of an element. Now pop (i.e. extract) the two largest elements off the heap. Draw the heap after each such extraction

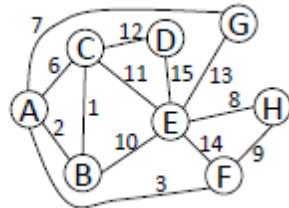
7. Give the preorder, in order, and post order traversal of the following tree.



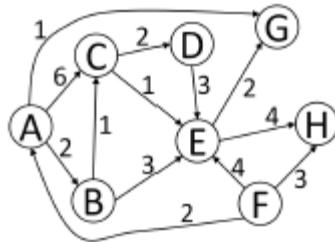
8. Write a recursive method static void mirror Tree(node root) that changes a given input tree so that it becomes the mirror image of the original tree. For example:



9. Use Prim's algorithm starting at node A to compute the Minimum Spanning Tree (MST) of the following graph. In particular, write down the edges of the MST in the order in which Prim's algorithm adds them to the MST. Use the format (node1; node2) to denote an edge.



10. In the graph below, use your algorithm from above to compute whether there is a path from node A to node E that has cost of at most 4. In particular, whenever BFS expands a new node, show the content of the main data structure that BFS maintains. Break ties arbitrarily.



Part 3- Operating System

- Consider the processes P1, P2, P3 arrived in the sequence P2, P3, P1 and the burst time of the processes are 3, 3, 24 respectively.
 - What is the average TAT?
 - What is the throughput?
 - What is the average waiting time?
 - What is the average response time?
- In real time Operating System, which is the most suitable scheduling scheme? And why?
- Which of the Algorithm gives long average waiting time? Justify with example.

4. Which of the below algorithms which implements synchronization mechanisms and satisfies all the four conditions such as Mutual Exclusion, Progress, Bounded Waiting and User Mode Execute?

(a) Random selection (c) TSL Algorithm
(b) Peterson's (d) All of the above

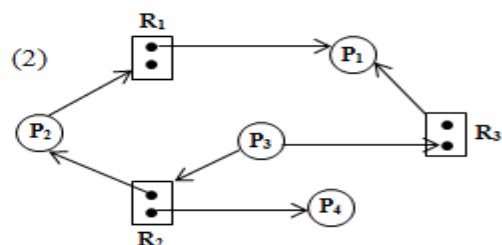
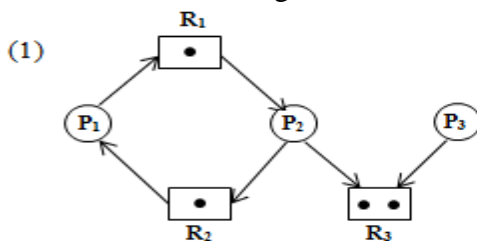
5. var occupied
var blocked
Enter Region:
{
If (occupied) {
then blocked= blocked +1
sleep ();
}
else occupied= 1;
}
Exit Region:
{
occupied= 0
If (blocked) {
then wakeup (process);
blocked= blocked - 1;
} }

a) Mutual Exclusion is guaranteed
b) Deadlock free Algorithm
c) Progress is guaranteed

Which of the above statements are false and why for the above segment?

(a) Only 1 (b) 1 & 2 (c) 1 & 3 (d) none of the above

6. Which of the following is True and why?



a) Deadlock occurs in both the cases
b) Deadlock occurs in (1) but not in (2)
c) Deadlock occurs in (2) but not in (1)
d) None of the above

7. P0: P(S), P(Q), Print("Hello"), V(Q), V(S)
P1: P(Q), P(S), Print("Hi"), V(Q), V(S)

Where S & Q are two semaphores initialized to 1. In the above situation:

- (a) Deadlock may occur (b) Bounded Waiting is satisfied
(c) Deadlock never occurs (d) both (a) & (b)

8. The arrival time, priority and durations of the CPU and I/O bursts for each of the three processes P₁, P₂ and P₃ are given in the table below. Each process has a CPU burst followed by an I/O burst followed by another CPU burst. Assume that each process has its own I/O resource.

| Process | AT | Priority | Burst duration CPU, I/O, CPU |
|----------------|----|-------------|---------------------------------|
| P ₁ | 0 | 2 | 1, 5, 3 |
| P ₂ | 2 | 3 (lowest) | 3, 3, 1 |
| P ₃ | 3 | 1 (highest) | 2, 3, 1 |

If the Preemptive priority scheduling is used, what is the finish times of the processes?

- (a) 11, 15, 9 (b) 10, 15, (c) 11, 16, 10 (d) 12, 17, 11
9. The following code with two threads can run in parallel. S and Q are binary semaphores equipped with P & V operations.

S= 1 & Q= 0;

Producer:

```
while (true) do
P(S);
x= Produce( );
V(Q)
done
```

Consumer:

```
while (true) do
P(Q);
Consume(x);
V(S)
done.
```

Which of the following is true?

- (a) The process can deadlock
(b) One of the threads can starve
(c) Some items produced may be lost
(d) None of the above
10. The highest response ratio next Scheduling policy favors 'X' jobs, but is also limits the waiting time of 'Y' jobs. What are X and Y?
- (a) Shorter Jobs, Low Priority Jobs (b) Longer Jobs, High Priority Jobs
(c) Longer Jobs, Shorter Jobs (d) Shorter Jobs, Longer Jobs