PART A : ICT 2153-DATA STRUCTURES (IT/ CCE)

24/01/2022

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5

The result of evaluation of 2 Y 2 * + 9 3 / 2 % - is 9. The value of Y is _____
(1 Point)

- 2
- 6
- 1
- 4

6

Consider a small circular linked list. How to detect the presence of cycles in this list effectively?
(1 Point)

- Circular linked list itself represents a cycle. So no new cycles cannot be generated
- Keep one node as head and traverse another temp node till the end to check if its 'next points to head
- Have fast and slow pointers with the fast pointer advancing two nodes at a time and slow pointer advancing by one node at a time
- Cannot determine, you have to pre-define if the list contains cycles

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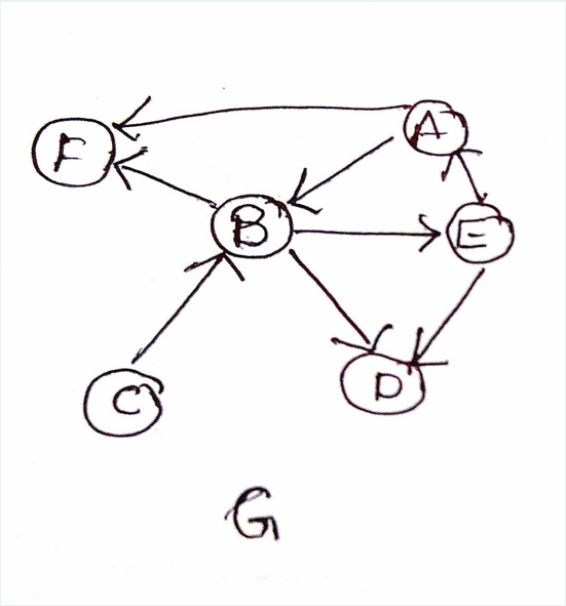

The in-degree and out-degree of vertex B for the graph G shown in the figure is _____ and _____ respectively.
(1 Point)

- 4 and 2
- 3 and 2
- 2 and 3
- 3 and 4

8

Assume a Polynomial is represented using a SLL containing nodes 4,7->3,5->2,2->1,1,NULL
Structure of each node: (coe,exp,next node address)
Write output of the following display function:

```
void node::display(node *f)   // f holds the address of the first node
{
node* c=f;
while(c)
{
if(c->exp%2==0) cout<<c->coe<<"^"<<c->exp<<" ";
c=c->next;
}
}
```

(1 Point)

- ◯ 4^7 2^2
- ◯ 4^7 2^2 1^1
- ◯ None of the mentioned
- ◯ 2^2

9

Suppose we have the following class whose underlying data structure is a linked list of

ListNodes.

```
class List {
  public:
    // other public functions
  ~List();
  class ListNode {
     int item;
    ListNode *next;
    };
ListNode *head;
};
```

Which of the following sequences of code could be used in the destructor ~List() to correctly delete all of the nodes in the list? (Which ones are legal, even if the style is atrocious?)

I.
```
for (ListNode *n = head; head != NULL; head = n) {
     n = head->next;
     delete head;
 }
```

II.
```
for (ListNode *n = head; n != NULL; n->next) {
      delete n;
   }
```

III.
```
ListNode* n;
    while (head != NULL) {
       n = head->next;
      delete head;
      head = n;
  }
```

(1 Point)

- ◯ I, II, and III
- ◯ I and III only
- ◯ I and II only
- ◯ II and III only

◯ III only

10

Consider the function fun defined below.

```
class node{
  int info;
  node *next;
};
int fun(node *p){
   return ((p == NULL) || (p ->next == NULL) || ((p->data <= p -> next -
> data) && f(p-> next)));
}
```

For a given linked list p, the function f returns 1 if and only if
(1 Point)

◯ The elements in the list are in non-ascending order of data value

◯ The elements in the list are sorted in non-decreasing order of data value

◯ Not all elements in the list have the same data value

◯ The list is empty or has exactly one element

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Suppose we're debugging a quicksort implementation that is supposed to sort an array in ascending order. After the first partition step has been completed, the contents of the array are in the following order: 3, 9, 1, 14, 17, 24, 22, 20

Which of the following statements is correct about the partition step?

(1 Point)

◯ Neither 14 nor 17 could have been the pivot

◯ The pivot could have been 14, but could not have been 17

◯ The pivot could have been either 14 or 17

- ◯ The pivot could have been 17, but could not have been 14

12

In a multiple stack having maxsize=9, current value of top array is [-1,5,7] and bottom array is [-1,2,5]. Size of each stack is _____ and number of elements stored in top-most stack is _____.
(1 Point)

- ◯ 2 and 3
- ◯ 3 and 3
- ◯ 2 and 2
- ◯ 3 and 2

13

What will be the values of rear and front after performing following operations on linear queue (maxsize=6).

(a) enqueue(10) (b) enqueue(20) (c)dequeue() (d)enqueue(30) (e)dequeue()

(1 Point)

- ◯ rear=1 and front=2
- ◯ rear=3 and front=2
- ◯ rear=3 and front=1
- ◯ rear=2 and front=1

14

Assume a DLL holds values 1,2,3,4,5,6,7 in same order, what will the following display function print?

```
void DLL::display(node *f)   // f holds the address of the first node
{
node* c=f;
while(c->next)  c=c->next;
while(c)
{
cout<<c->data<<" ";
c=c->prev;
}
}
```

(1 Point)

- 6 7 4 5 3 2 1
- 7 6 5 4 3 2 1
- 2 1 4 3 6 5 7
- 1 2 3 4 5 6 7

15

Which of the following is TRUE for a spanning tree of any graph G?
(1 Point)

- The vertex set of a spanning tree is same as graph G
- Spanning tree is defined only for undirected graph
- The edge set of a spanning tree is same as edge set of graph G
- The spanning tree will have maximum number of edges

16

```
int * fun(int *ptr1, int *ptr2, int * sum)
{
  int a=10, b=20, c=30, d=40;
  ptr1=&a;
  ptr2=&b;
 *ptr1++;
 *ptr2--;
 ptr1=&c;
 ptr2=&d;
 (*ptr1)++;
 (*ptr2)--;
 *sum=*ptr1+*ptr2;
 cout<<a<<" "<<b<<" "<<c<<" "<<d
 return sum;
}
```

What is the output of the function fun() ?
(1 Point)

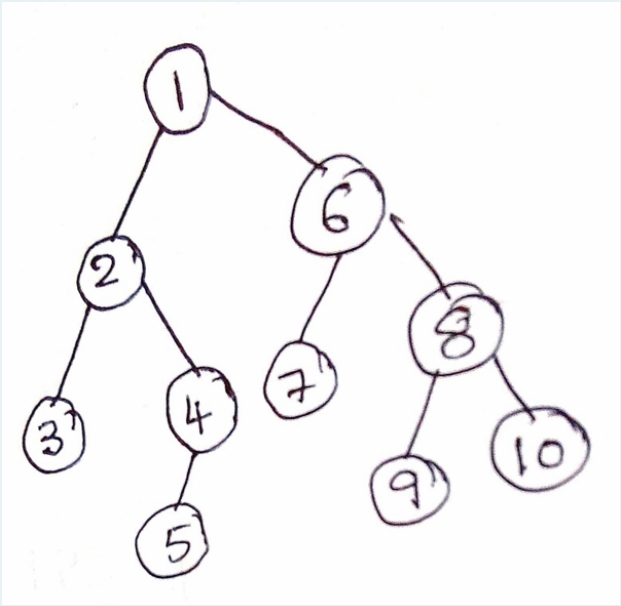
- 10, 20, 31, 39, 70
- 11, 19, 31, 39
- 10, 20, 31, 39
- 11, 19, 31, 39, 70

17

What will be the values of front and rear if a circular Queue (maxsize=5) contains 99,NS,NS,NS,88 where NS means "Not stored any value" and 99 is recently added circular Queue element?
(1 Point)

- front=3 and rear=1
- front=0 and rear=3
- front=3 and rear=0
- front=2 and rear=0

18



Write the output of the following error-free code for the tree shown in the figure:

```
 // address of the root node is the initial value of the ptr

void find( btree *ptr)
{ if(ptr)

      { find(ptr->rchild);
        find(ptr->lchild);
        cout<<ptr->data<<" ";
     }

 }
```

(1 Point)

- ◯ 3 2 5 4 1 7 6 9 8 10
- ◯ 10 9 8 7 6 5 4 3 2 1
- ◯ 5 4 3 2 10 9 8 7 6 1
- ◯ 10 9 8 7 6 3 5 4 2 1

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Which of the following can be used to insert a new node pointed by ptr at any position pointed by temp in a circular doubly linked list where fwd and bwd represents the forward and backward links to the adjacent elements of the list?
(1 Point)

- p=temp; p->bwd = temp->bwd; temp->fwd = p;
- temp->fwd = p; temp->bwd = p->bwd; p=temp;
- p->bwd->fwd = p->fwd; p->fwd->bwd = p->bwd->fwd;
- p->bwd = temp; p->fwd = temp->fwd; temp->fwd = p; p->fwd->bwd = p;

20

Consider a Graph with Vertex set {A,B,C,D} represented using adjacency matrix [[0,1,1,0], [1,0,1,1], [1,1,0,0], [0,1,0,0]]. Which of the following is BFS of the Graph.
(1 Point)

- ADBC
- ADCB
- ABCD
- None of the mentioned

21

Which of the following statement is true with respect to a graph?
(1 Point)

- The sum of the degrees of all the nodes is twice the number of edges
- The sum of the degrees of all the nodes is equal half of number of edges

- The sum of the degrees of all the nodes is equal to the number of edges
- The sum of the degrees of a node is equal to the number of edges

22

```
void fun(node *head)
{
    node *prev, *next1;
    prev=head;
   while(prev!=NULL)
   {
     next1=prev->next;
     cout<<next1->data;
     cout-<<prev->data;
    prev=next1->next;
   }
}
```

What is the significance of the function fun() on linked list:
(1 Point)

- Exchange elements of every two nodes
- Display elements of alternate nodes from start interchanging their positions
- Display elements of every two consecutive nodes from start interchanging their positions
- Exchange elements of alternate nodes

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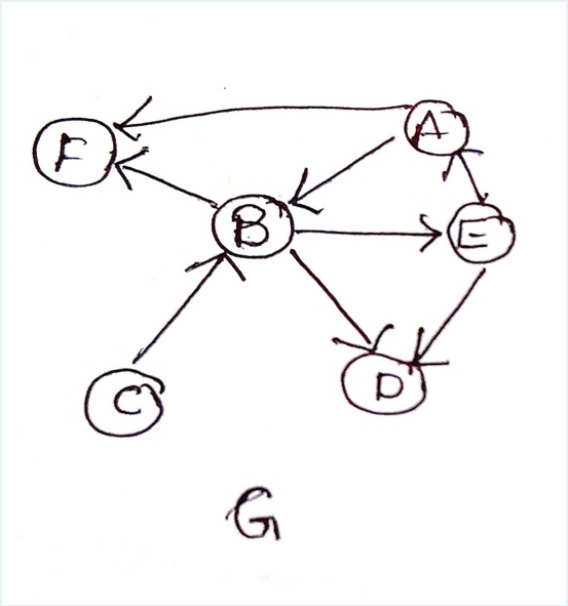
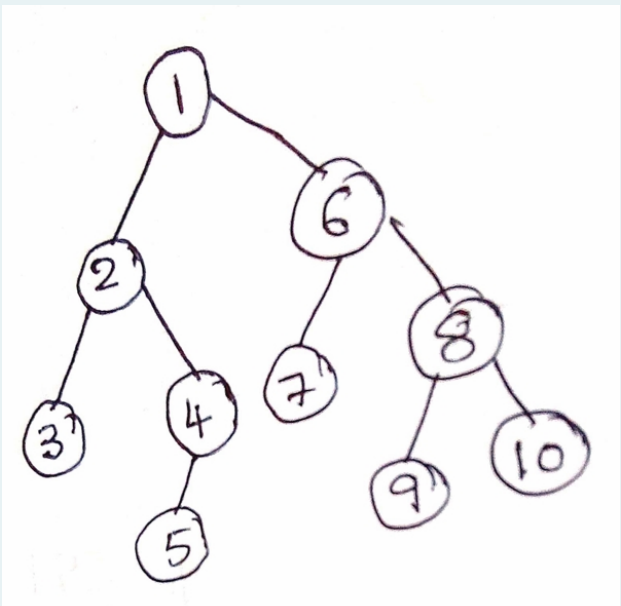
The adjacency list for the vertex 'B' of graph G shown is :
(1 Point)



- E --> D--> F
- A-->C-->D-->E-->F
- A-->E-->D
- A-->C

24



In the threaded binary tree representation of the tree shown in the figure, the left child and right child of node "5" will be pointing to _____ and _____ respectively.
(1 Point)

- 4 and 3

- ◯ 1 and 3
- ◯ 2 and 4
- ◯ Head node and 4

25

The level-order traversal of the expression tree created for - + * / 5 4 3 % 6 8 1 is _____
(1 Point)

- ◯ - + 1 % * 6 8 / 3 5 4
- ◯ - + 1 * % / 3 6 8 5 4
- ◯ */ + % 5 4 – 6 8 4 3 1
- ◯ + * - / 4 3 1% 5 6 8

26

Consider a max heap represented as an array as shown below:
50, 35, 36, 32, 33, 20, 25, 10, 22
After deleting the root node and readjusting the heap, the resultant array is
(1 Point)

- ◯ 36, 35, 25, 32, 33, 20, 22, 10
- ◯ 36, 25, 35, 32, 33, 20, 22, 10
- ◯ 36, 35, 22, 32, 33, 20, 25, 10
- ◯ 22, 35, 36, 32, 33, 20, 25, 10

27

Consider a function InsertEnd( ), which will insert a node to existing DLL. Choose correct MISSING_LINE from options:

```
void node::insEnd(){
node *cur;
node *temp = new node;
temp->next=NULL;
temp->prev=NULL;
if(head==NULL) //head is address of first node
head = temp;
else {
MISSING_LINE
cur->next = temp;
temp->prev=cur;
}
}
```

(1 Point)

- for(cur=head; cur!=NULL;cur=cur->next)
- for(cur=head; cur->next!=NULL;cur=cur->next)
- for(cur=head; cur!=NULL;cur=cur->next);
- for(cur=head; cur->next!=NULL;cur=cur->next);

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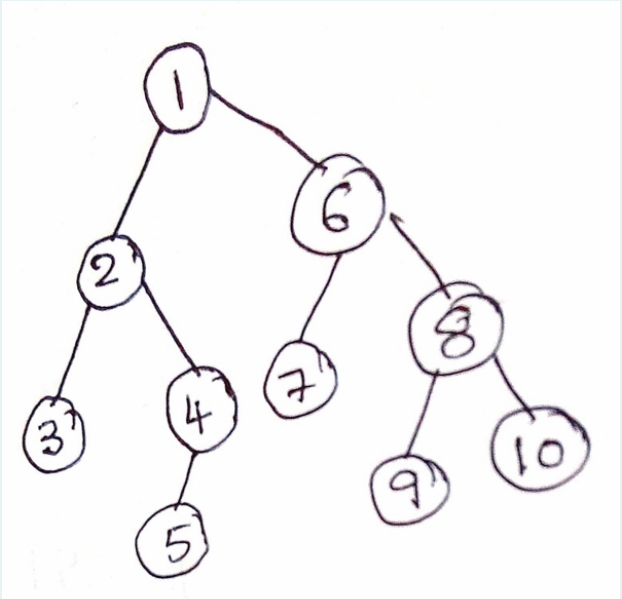

Which node address is returned by the following error-free code for the threaded binary tree representation of the tree shown in the figure? Assume address of node 1 is passed as an argument.

```
thread_tree find (thread_tree *root)

{
        thread_tree  *temp;
        temp = root->leftchild;
        if(!root->rightthread)
              while(!temp->leftthread)
                    temp=temp->leftchild;
       return temp;
}
```

(1 Point)

- 4
- 5
- 7
- 3

29

```
void fun(int numbers[], int *p)
{
   p=numbers;
   p[0]=10;
   *p=15;
   p=&numbers[2];
  *p=20;
   p--;
   *p=35;
   p=numbers+3;
  *p=40;
   p=numbers;
  *(p+4)=55;
  for(int i=0;i<5;i++)
        cout<<numbers[i]<<", ";
}
```

What is the output of the function fun()?
(1 Point)

- 15, 35, 20, 40, 55
- 10, 35, 20, 40, 55
- 10, 20, 35, 40, 55
- 15, 20, 35, 40, 55

30

A binary search tree is generated by inserting in order the following integers:
150, 115, 162, 15, 250, 508, 191, 23, 78, 137, 620, 78
The number of nodes in the left subtree and right subtree of the root respectively is

(1 Point)

- (7, 4)
- (6, 5)
- (4,7)
- (5, 6)

31

Which of the following is true with respect to the graph mentioned below:
V(G)={A, B, C, D, E, F}
E(G)={<A,B>, <B,E>, <A,E>, <E,F>, <C,D>}
(1 Point)

- It neither a connected nor a disconnected graph
- It is a directed connected graph
- It is an undirected connected graph
- It is a disconnected graph

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The pre-order and in-order traversals of a binary tree are T, M, L, N, P, O, Q and L, M, N, T, O, P, Q. Which of following is post-order traversal of the tree?
(1 Point)

- L M N O P Q T
- N M O P O L T
- L N M O Q P T
- O P L M N Q T

33

Consider the following array. What is the partition index of first partition operation using quicksort technique:
40, 31, 9, 80, 35, 62
(1 Point)

- 3
- 2
- 4
- 1

34

Consider the following algorithm, fun(). What is the time complexity of the function using step count method?

```
algorithm fun()
{
  if n <= 1 then
        output 'n'
  else{
        f2 = 0;
        f1 = 1;
  }
 for i = 2 to n do {
       f = f1 + f2;
       f2 = f1;
       f1 = f;
 }
 output 'f'
}
```

(1 Point)

- ◯ 4n - 1
- ◯ 2n + 1
- ◯ 4n + 2
- ◯ 4n + 1

Submit