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राष्ट्रीय प्रौधोगिकी संस्थान गोवा

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

Programme Name: B.Tech.

Mid Semester Examinations, October-2020

Course Name: Data Structures | Course Code: CS201

Date: 6/10/2020 | Time: 9:30 AM-11:00 AM

Duration: 1 Hour 30 Minutes | Max. Marks: 50

ANSWER ALL QUESTIONS

1. What is precondition of binary search in an array? Write the binary search algorithm. (4 Marks)

2. In C language, if the base address of **int a[4][6]** is 100, calculate the address of a[2][4] in both row major and column major order. (Assume the size of int to be 4 bytes). (4 Marks)

3. Using stack, evaluate the following expression.

   9 3 2 ^ / 3 4 * + 6 2 * -

   Note: single digit operands are used.
   ^ indicates exponential operator.
   Write down all the steps required. (6 Marks)

4. Consider the following pseudo code of a function named star.Explain the following function with an example?(Assume there is no syntax error) (6 Marks)

```
void star(int t)
{
 int x;
Stack Z;  // Assume empty stack Z is created.
while (t > 0)
{
// Pushes t%3 to stack Z
 push(&Z, t%3);
 t = t/3;
 }
 // Execute till Stack Z is not empty
 while (!isempty(&Z))
 {
 x = pop(&Z);
 printf("%d ", x*x);
 }
  }
```

5. What is circular queue? Write a 'C' function to insert an element into the circular queue. Write the merits of circular queue over queue. (6 Marks)

6. Consider the following pseudo code of a function named star.Explain the following function?(Assume there is no syntax error) (6 Marks)

```
void star(Queue *W)
{
   Stack Z;  // Assume an empty stack Z is created

   // Execute as long as W is not empty
   while (!isempty(W))
   {

            //Push the dequeued item from W into Z
     push(&Z, Dequeue(W));
   }

   // Execute as long as Z is not empty
   while (!isempty(&Z))
   {
    // Enqueued the poppped item from Z into W
    Enqueue(W, pop(&Z));
   }
}
```

7. Lets assume Z1, Z2 and W represent two stacks and a Queue respectively. Explain what does the following pseudo codes star1 and star2 indicate? (Assume there is no syntax error). (6 Marks)

```
void star1(W, x) {
push (Z1, x);
}

void star2(W){
if(stack-empty(Z2)) then
if(stack-empty(Z1)) then {
 print("W is empty");
 return;
 }
 else while (!(stack-empty(Z1))){
 x=pop(Z1);
 push(Z2,x);
 }
  x=pop(Z2);
 }
```

8. Describe node structure of a doubly linked list. Write a 'C' functions to insert a node at beginning and delete last node of a non empty doubly linked list. (6 Marks)

9. A function f defined on queues of integers satisfies the following properties. f(ø) = 0 and f (Enqueue (Q, i)) = max (f(Q), 0) + i for all queues Q and integers i. If a queue Q contains the integers 20, 30, -200, 100, 200 in order from rear to front, what is f(Q)?

(6 Marks)