

QUESTIONS

I. Multiple Choice Questions (Multiple options may be correct.)

1. Array index in C starts with

- a. -1
- b. 0
- c. 1
- d. START

2. What is the output of the following C program?

```
int main() {  
    int a[];  
    a[4] = {1, 2, 3, 4};  
    printf("%d", a[0]);  
    return 0;  
}
```

- a. 1
- b. NULL
- c. 4
- d. There will be an error.

3. What is an array?

- a. A group of elements following a specific pattern.
- b. A group of elements of the same datatype.
- c. A group of elements stored in continuous memory locations.
- d. All of the above.

4. How do we initialize an array with all elements as zero in C?

- a. `int array[5];`
- b. `int array[5] = {0}`
- c. `int array[5] = {0, 0, 0, 0, 0}`
- d. All of the above.

5. What is the purpose of a two-dimensional array?

- a. Storing only single elements.
- b. Storing elements in a grid format.
- c. Storing elements in a linked list.
- d. Storing elements in a stack.

6. Which of the following declarations can be used to store a two-dimensional integer array containing 3 rows and 5 columns?

- a. `int **a;`
- b. `int[4][] a;`
- c. `int[][5] a;`
- d. `int[4][5] a;`

7. What is the next of the last element of a circular linked list?
 - a. NULL
 - b. head
 - c. head->prev
 - d. last->next
8. Which of the following linked list operations can be implemented without using any loop?
 - a. Traversal
 - b. Insertion at the beginning
 - c. Insertion at the end
 - d. Insertion at any point
9. What is the advantage of linked list over array?
 - a. The elements in a linked list can be accessed faster than those in array.
 - b. Linked lists can be dynamically resized.
 - c. Linked list can be traversed without any errors.
 - d. Linked list generally takes less memory than array.
10. What is the main advantage of double linked list over single linked list?
 - a. It uses lesser memory than single linked list.
 - b. It is easier to create and implement than single linked list.
 - c. It can be traversed in both directions.
 - d. It does not have any advantage over single linked list.

II. True and False.

1. A string in C is a one-dimensional array of characters.
2. An array can be passed as arguments to functions or can be returned from functions directly.
3. In C, `int[4][5]` is a two-dimensional integer array containing 4 columns and 5 rows.
4. The number of elements in each row of a two-dimensional array in C may be different.
5. In two-dimensional arrays, elements are stored in contiguous memory location
6. In a linked list, elements are stored in contiguous memory location.
7. A double linked list can be created by combining two single linked lists.
8. In a circular linked list, no element has NULL as its next.
9. In a double linked list, there are two self-referencing pointers.
10. If the last element of a single linked list points to the first element of the list, it forms a circular linked list.

III. Match the following.

1	malloc	prev, next, value
2	free	Allocates memory in heap and initializes all bits to 0.
3	calloc	next, value
4	realloc	An array containing memory locations.
5	struct	Changes the size of an existing array.
6	Pointer to array	Allocates memory in heap.
7	Array of pointers	Group of values of different data type.
8	Single linked list	next (can be NULL), value
9	Double linked list	Memory location of the first element of an array
10	Circular linked list	Deletes allocated memory.

IV. Fill in the blanks.

1. _____ operator is used to access a member of a struct pointer in C.
2. _____ keyword is used to find the size of a datatype or struct in C.
3. _____ keyword is used to create aliases for structs in C.
4. The _____ preprocessor is used to declare compile time constants.
5. Each element of a linked list is called a _____.
6. The last element of a _____ is connected to its first element.
7. In a linked list, the first element is called _____ and the last element is called _____.
8. Complete the following code to insert an element at the end of a linked list.

```
void append(list)
    while _____
        list = list->next
    new_element = ...
    list->next = new_element
```
9. A circular linked list can be traversed in _____ direction(s).
10. A double linked list can be traversed in _____ direction(s).

V. One word answer.

1. Given an array of length n, what is the index of the last element of the array?
2. Given an integer array of length n, what is the size of the entire array? (Consider that the size of int is 4 bytes.)
3. What is the datatype of NULL in C?

4. What datatype does malloc return?
5. In which file is realloc defined?
6. Which line(s) in the code given below contains error? If it does not have any error, what will be its output? (Consider that the size of int is 4 bytes and that of long is 8 bytes.)

```
long sizeof_array(int *array) {  
    return sizeof(array);  
}  
int main() {  
    int array[5] = {1, 2, 3, 4, 5};  
    printf("%ld %ld\n", sizeof(array), sizeof_array(array));  
    return 0;  
}
```

7. Which line(s) in the code given below contains error? (If any.)

```
typedef struct Box {  
    int id;  
    Box subbox;  
} Box;
```

8. How many loops are needed to insert an element in the beginning of a circular linked list?
9. Given that a double linked list stores a double of size 8 bytes and int of size 4 bytes, and that the size of a pointer is 8 bytes, what is the size of each element of the list? (Consider that there is no extra padding in the struct.)
10. Given that first is the first element of a linked list, what does value store in the following code?

```
value = 0;  
for (element = first; element->next != NULL; element = element->next)  
    ++value;
```