B. Tech 3rd Semester End Term Examination- 2021
Subject: DATA STRUCTURES AND PROGRAMMING METHODOLOGY
(Paper Code: UCS03C14 / UCS03C08)

Time: 2 hour Maximum Marks: 50

This exam contains 5 pages (including this page) and 22 problems.

[Section A]

This section comprises of questions to deal with the theoretical knowledge of the subject. Total marks of each question is equally divided among sub questions.

1. Among the given options, which data structure may give overflow error, even though the current n elements in it is less than it's size?
   a) Heap
   b) Simple Queue
   c) Circular Queue
   d) Stack
   e) Linked List
   f) None of these [2]

2. Which abstract data type can be used to represent one-to-many relations?
   a) Tree Only
   b) Plex
   c) Graph
   d) Both Plex and Graph [2]

3. Suppose we are sorting an array with 8 integers using quick sort. After finishing the first partitioning, the array is looking like this: 34 23 11 2 54 88 75 70
   Which one is the pivot element? [2]

4. If you want to sort many large objects or structures, it would be most efficient to place
   a) them in a an array and sort the array.
   b) pointers to them in an array and sort the array.
   c) them in a linked list and sort the linked list.
   d) reference to them in an array and sort the array. [2]

5. Let X be the adjacency matrix of a graph G, with no self loops. The entries along the principle diagonal of X are?(Give your answer as exact numerical value) [2]

6. Linked list is considered as a _____ data structures? [2]

7. Which of the following data structure could be considered as a recursive data structure?
   a) Linked list
   b) Tree
   c) Both Linked List and Tree
   d) Circular Queue [2]

8. Which of the following data structure could be considered as a recursive data structure?
   a) 64
   b) $2^{64} - 1$
   c) $64^2 - 1$
   d) $64^{64} - 1$
   e) None of the options. [2]

9. If we consider two statements as
   i) Infinite recursion can occur when a recursive algorithm does not contain a base case.
   ii) Infinite recursion can occur when a recursive algorithm contains a base case.
   Select the appropriate option.
   a) F, F
   b) F, T
   c) T, F
   d) T, T

   [2]

10. A binary tree in which if all its levels except possibly the last, have the maximum number of nodes and all the nodes at the last level appears as far left as possible is known as a
    a) full binary tree
    b) 2- tree
    c) threaded tree
    d) complete binary tree

    [2]

[Section B]

This section comprises of questions to identify the Data Structure application know how and problem solving ability. This includes concepts of programming and pseudo code understanding using C language.

11. Select the appropriate function which does the same work as the following code.

```c
int mystery(char *s, char *t)
{
  for(; *s == *t && *s!='\0';s,t);
  return(*s-*t)

}
```

[3]

12. Using

```c
#include <stdio.h>
```

and

```c
#include "stdio.h"
```

means
a) both the statements are of no difference
b) In case of using the brackets (<>) the compiler will only look in the current directory.
c) In case of using the quotes ("") the compiler will look in to the default location for the header files.
d) None of the options.

[3]

13. Predict the execution of the code and select appropriate option as output.

```
#include <stdio.h>

int main()
{
  const char *s="";
  char str[]="DSPM Exam";
  s=str;
  while(*s)
    printf("%c",*s++);
  return 0;
}
```

a) DSPM Exam
b) Run-time Error.
c) Compiler Error.
d) Garbage Output.
e) None of the options.

[3]

14. Predict the execution of the code and select appropriate option as output.

```
#include <stdio.h>

int main() {

    printf("%c","DSPMExam"[2]);
    printf("DSPMExam"+3);
    printf(2+"Exiting");
    return 0;
}
```

a) DSPMExam
b) PMMi
c) Compiler Error.
d) DSDSPEx
e) DSPMExamDSPMExamExiting
f) None of the options.

[3]

15. If the following code is executed from the command line with input as 11 22 33, select the correct output.

```c
#include <stdio.h>

int main(int argc, char *argv[])
{

    int j;
      j=atoi(argv[0]+argv[1]+argv[2]);
    printf("%d",j);
    return 0;
}
```

a) Run-time Error
b) Compiler Error.
c) 66
d) 33
e) 22

[3]

[Section C]

This section comprises of fundamental questions that require significant analysis of topic and in depth understanding.

16. Let S be a stack of size $n >= 1$. Starting with the empty stack, suppose we push the first n natural numbers in sequence and then perform n pop operations. Assume that PUSH and POP operations take X seconds each, and Y seconds elapsed between the end of one such stack operation and the start of the next operation. For $m >= 1$, define the stack life of m as the time elapsed from the end of PUSH(m) to the start of the POP operation that moves m from S. Derive the average stack life of an element of this stack S. Select the appropriate option.
    a) m(X+Y)
    b) 3Y+2X
    c) X+Y
    d) n(X+Y)-X
    e) Y+2X [3]

17. Each element of an array $a[-20....20, 10....35]$ require one byte of storage. If the array is in column major order implemented and the beginning of the array is at location 500(base address). Determine the address of the element a[0,30]. Select the appropriate option.
    a) 1189
    b) 1340
    c) 1456
    d) 578 [3]

18. A jagged array is an array whose elements are arrays
    a) exactly of same size
    b) possibly of different sizes
    c) exactly half of the original size
    d) exactly double of the original size [2]

19. A hash table with 9 slots is having the hash function as $h(k) = kmod9$. The collisions are resolved by chaining. The following 9 keys are inserted in the *order* : $55, 30, 28, 5, 46, 69, 80, 11, 15$. Find out the maximum, minimum, and average chain lengths in the hash table.
    a) 4, 1 and 0
    b) 3, 0 and 1
    c) 2, 1 and 1
    d) 3, 3 and 3 [2]

20. The pre-order traversal of a binary search tree is $35, 13, 7, 8, 26, 70, 40, 75$. Which one of the following is the post-order traversal of the same tree?
    a) 7, 8, 26, 13, 75, 40, 70, 35
    b) 26, 13, 7, 8, 70, 75, 40, 35
    c) 7, 8, 13, 26, 35, 40, 70, 35
    d) 8, 7, 26, 13, 40, 75, 70, 35 [2]

21. What data structure would you mostly likely see in a non recursive implementation of a recursive algorithm?
    a) Linked List
    b) Stack
    c) Queue
    d) Tree [2]

22. A circuit in a connected graph which includes ever vertex of the graph is known as
    a) Euler
    b) Universal
    c) Hamiltonian
    d) Clique [1]

This is for the student's reference

Question:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	**Tota**
Marks:	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	2	2	2	2	1	50
Score:																							

DSPM End-term examination 2021(Section A, B, IIIT Agartala)

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* Required

Response to the questions

Question1 *

- ○ Heap
- ◉ Simple Queue
- ○ Circular Queue
- ○ Stack
- ○ Linked List
- ○ None of these

Question 2 *

- ○ tree only
- ○ plex
- ◉ graph
- ○ both plex and graph

Question 3 *

- ○ 34
- ○ 23
- ○ 11
- ○ 2
- ◉ 54
- ○ 88
- ○ 75
- ○ 70

Question 4 *

- ○ a
- ◉ b
- ○ c
- ○ d

Question 5(Enter exact numerical value only with out any space) *

0

Question 6 *

- (●) Linear only
- ( ) Non Linear only
- ( ) Hierarchical
- ( ) None of the options

Question 7 *

- ( ) a
- ( ) b
- (●) c
- ( ) d

Question 8 *

- ( ) a
- (●) b
- ( ) c
- ( ) d
- ( ) e

Question 9 *

- [ ] a
- [ ] b
- [ ] c
- [x] d

Question 10 *

- [ ] a
- [ ] b
- [ ] c
- [x] d

Question 11 *

- [ ] strlen()
- [x] strcmp()
- [ ] strstr()
- [ ] strchar()

Question 12 *

- [ ] a
- [ ] b
- [ ] c
- [x] d

Question 13 *

- [x] a
- [ ] b
- [ ] c
- [ ] d
- [ ] e

Question 14 *

- [ ] a
- [ ] b
- [ ] c
- [ ] d
- [ ] e
- [x] f

Question 15 *

- [ ] a
- [x] b
- [ ] c
- [ ] d
- [ ] e

Question 16 *

- [ ] a
- [ ] b
- [ ] c
- [x] d
- [ ] e

Questio 17 *

- [ ] a
- [x] b
- [ ] c
- [ ] d

Question 18 *

- [ ] a
- [x] b
- [ ] c
- [ ] d

Question 19 *

- [ ] a
- [x] b
- [ ] c
- [ ] d

Question 20 *

- [ ] a
- [ ] b
- [ ] c
- [x] d

Question 21 *

- [ ] a
- [x] b
- [ ] c
- [ ] d

Question 22 *

- [ ] a
- [ ] b
- [x] c
- [ ] d

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