BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IM.Sc. **SEMESTER : I**
BRANCH: QEDS **SESSION : MO/2023**

SUBJECT: ED109 INTRODUCTION TO PROGRAMING & DATA STRUCTURE

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

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Q.1(a)	Consider a pipelined processor with the following four stages: IF: Instruction Fetch ID: Instruction Decode and Operand Fetch EX: Execute WB: Write Back The IF, ID and WB stages take one clock cycle each to complete the operation. The number of clock cycles for the EX-stage depends on the instruction. The ADD and SUB instructions need 1 clock cycle and the MUL instruction needs 3 clock cycles in the EX-stage. Operand forwarding is used in the pipelined processor. Evaluate the number of clock cycles taken to complete the following sequence of instructions. ADD R2, R1, R0 R2<- R1+ R0 MUL R4, R3, R2 R4<- R3 * R2 SUB R6, R5, R4 R6<- R5- R4	[5]	I
Q.1(b)	If $(11P1Q)_8 = (12C9)_{16,}$ C here stands for Decimal 12. Calculate the values of P and Q.	[5]	I
Q.2(a)	Describe the working of a Solid-State Storage Device.	[5]	II
Q.2(b)	Describe the data models used for designing the database management systems.	[5]	II
Q.3(a)	Evaluate the value of queues Q1 and Q2, and stack S after the following algorithm segment:	[5]	III

```
 1 S  = createStack
 2 Q1 = createQueue
 3 Q2 = createQueue
 4 enqueue (Q1, 5)
 5 enqueue (Q1, 6)
 6 enqueue (Q1, 9)
 7 enqueue (Q1, 0)
 8 enqueue (Q1, 7)
 9 enqueue (Q1, 5)
10 enqueue (Q1, 0)
11 enqueue (Q1, 2)
12 enqueue (Q1, 6)
13 loop (not emptyQueue (Q1))
   1 dequeue (Q1, x)
   2 if (x == 0)
      1 z = 0
      2 loop (not emptyStack (S))
         1 popStack (S, y)
         2 z = z + y
      3 end loop
      4 enqueue (Q2, z)
   3 else
      1 pushStack (S, x)
   4 end if
14 end loop
```

PTO

Q.3(b) Describe the following code snippet. [5] III

```
struct CellNode{
struct CellNode *leftChild;
int element;
struct CellNode *rightChild;
};
int GetValue (struct CellNode *ptr) {
int value = 0;
if (ptr != NULL) {
    if ((ptr→leftChild == NULL) &&
          (ptr→rightChild == NULL))
      value = 1;
else
    value = value + GetValue (ptr→leftChild)
                  + GetValue (ptr→rightChild);
}
return (value);
}
```

Q.4(a) Convert the following infix expression to postfix expression using the algorithmic methods (a stack data structure) [5] IV

(A – 2 * (B + C) – D * E) * F

Q.4(b) Describe the events happening if we applied the following statements to below list? [5] IV

set temp to pList
loop (temp link not null)
    set temp to temp link
end loop
set temp link to pList

Q.5(a) After two passes of a sorting algorithm, the following array: [5] V

47 3 21 32 56 92

has been rearranged as shown below.

3 21 47 32 56 92

Which sorting algorithm is being used (bubble, or insertion)? Defend your answer.

Q.5(b) Describe the steps of sorting the following elements using Merge Sort. [5] V

7 2 9 4 3 8 6 1

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