**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**
**(MID SEMESTER EXAMINATION SP/2025)**

**CLASS: IMSC** **SEMESTER : II**
**BRANCH: QEDS** **SESSION : SP/2025**

**SUBJECT: ED24119 PROGRAMMING LANGUAGE AND DBMS**

**TIME: 02 Hours** **FULL MARKS: 25**

**INSTRUCTIONS:**

**1. The question paper contains 5 questions each of 5 marks and total 25 marks.**
**2. Attempt all questions.**
**3. The missing data, if any, may be assumed suitably.**
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

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| | | | CO | BL |
|---|---|---|---|---|
| Q.1(a) | How can polymorphism be applied to define a common interface for different types of employees in a company while allowing different behaviors for each type? Explain briefly. | [2] | CO1 | BL2 |
| Q.1(b) | Discuss the different types of inheritance. Provide examples demonstrating multiple and multilevel inheritance in C++ | [3] | CO1 | BL2 |
| Q.2 | Complete the following snippet of code in C++ which implements a basic example of inheritance and object-oriented programming. Fill in the blanks: | [5] | CO1 | BL3 |

```
#include <iostream>
using namespace std;
class Gadget {
public:
   string _____; // (1)
   void displayGadget() {
      cout << "Gadget: " << _____ << endl; // (2)
   }
};
class Smartphone : public _____ { // (3)
public:
   string _____; // (4)
   Smartphone(string g, string m) {
      _____ = g; // (5)
      model = m;
   }
   void showSmartphone() {
      cout << "Gadget: " << gadgetName << ", Model: " << model << endl;
   }
};
int main() {
   Smartphone myPhone("Samsung", "Galaxy S21");
   myPhone.showSmartphone();
   return 0;
}
```

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|---|---|---|---|---|
| Q.3 | Design an ER model for a school academic management system to track students, subjects, and teachers. Identify the entities, attributes, and relationships, ensuring one-to-many and many-to-many mapping constraints. Incorporate a ternary relationship, existence dependency, and generalization for subject types (e.g., core, elective). Represent the design with an ER diagram. | [5] | CO2 | BL1 |
| Q.4 | A Students table has 50,000 records, each 150 bytes, stored on a 4 KB disk block. The primary key is Student_ID (sorted). A secondary index on Student_Name is created, where each index entry has a 30-byte name and an 8-byte pointer.<br>a) How many records can fit in one disk block?<br>b) How many blocks are required to store the entire Students table?<br>c) How many secondary index entries will be created?<br>d) How many blocks are required to store the secondary index?<br>e) What is the time complexity of searching for a student record using secondary indexing? | [5] | CO2 | BL3 |
| Q.5 | Explain the concept of the 3-level architecture in database systems. How do these levels interact, and why is it important for a database management system to implement these levels? | [5] | CO2 | BL1 |

**::::::04/03/2025::::::M**