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

**CLASS: I MSc.** **SEMESTER : II**
**BRANCH: QEDS** **SESSION : SP/2025**

**SUBJECT: ED24119 PROGRAMMING LANGUAGE AND DATABASE MANAGEMENT SYSTEM**

**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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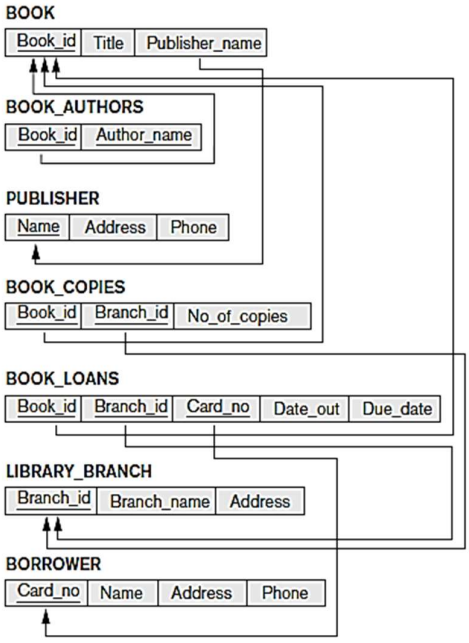
| Q.1(a) | Describe the concept of friend function, virtual function and polymorphism with suitable examples. | [5] | CO1 | 1 |
| Q.1(b) | In the college, it was decided to modify the rules of computation of grades for players. Accordingly modify the classes student and player such that the player class also has a function 'compute_grade'. Use the concept of function overriding such that at run time, for player object, the computation of grade is done using the compute_grade() function of player class. Choose appropriate rules for the computation of grades for the player object. | [5] | CO1 | 1,2 |
| Q.2(a) | A database is being constructed to keep track of the teams and games of a sports league. A team has several players, not all of whom participate in each game. It is desired to keep track of the players participating in each game for each team, the positions they played in that game, and the result of the game. Design an ER schema diagram for this application, stating any assumptions you make. Choose your favourite sport (e.g., soccer, baseball, football). | [5] | CO2 | 2,3 |
| Q.2(b) | Consider the following relations for a database that keeps track of business trips of salespersons in a sales office:<br>*SALESPERSON (Ssn, Name, Start_year, Dept_no)*<br>*TRIP (Ssn, From_city, To_city, Departure_date, Return_date, Trip_id)*<br>*EXPENSE (Trip_id, Account#, Amount)*<br>A trip can be charged to one or more accounts. Specify the foreign keys for this schema, stating any assumptions you make. | [5] | CO2 | 2,3 |
| Q.3 | Consider the LIBRARY relational database schema shown below to answer the following questions. | | | |




**PTO**

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| (a) | Choose the appropriate action (reject, cascade, set to NULL, set to default) for each referential integrity constraint, both for the deletion of a referenced tuple and for the update of a primary key attribute value in a referenced tuple. Justify your choices. | [5] | CO3 | 3 |
| **(b)** | i. How many copies of the book titled The Lost Tribe are owned by the library branch whose name is 'Sharpstown'?<br>ii. How many copies of the book titled The Lost Tribe are owned by each library branch?<br>iii. Retrieve the names of all borrowers who do not have any books checked out.<br>iv. For each book that is loaned out from the Sharpstown branch and whose Due_date is today, retrieve the book title, the borrower's name, and the borrower's address.<br>v. For each library branch, retrieve the branch name and the total number of books loaned out from that branch. | [5] | | 4 |

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| Q.4(a) | Consider the SQL query.<br>**select** p.a1<br>**from** p, r1, r2<br>**where** p.a1 = r1.a1 or p.a1 = r2.a1<br>Under what conditions does the preceding query select values of p.a1 that are either in r1 or in r2? Examine carefully the cases where either r1 or r2 may be empty. | [2] | CO4 | 4 |
| Q.4(b) | Rewrite the where clause<br>**where unique** (**select** title **from** course)<br>without using the unique construct. | [3] | CO4 | 3 |
| Q.4(c) | SQL allows a foreign-key dependency to refer to the same relation, as in the following example:<br>**create table** manager<br>(employee_ID **char**(20),<br>manager_ID **char**(20),<br>**primary key** employee_ID,<br>**foreign key** (manager_ID) **references** manager (employee_ID)<br>**on delete cascade**)<br>Here, employee_ID is a key to the table manager, meaning that each employee has at most one manager. The foreign-key clause requires that every manager also be an employee. Explain exactly what happens when a tuple in the relation manager is deleted. | [5] | CO4 | 5 |

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| Q.5(a) | Consider the universal relation R = {A, B, C, D, E, F, G, H, I, J} and the set of functional dependencies F = {{A, B}→{C}, {A}→{D, E}, {B}→{F}, {F}→{G, H}, {D}→{I, J}}. What is the key for R? Decompose R into 2NF and then 3NF relations. | [5] | CO5 | 5,6 |
| Q.5(b) | Consider the schema R = (A, B, C, D, E, G, H) and the set F of functional dependencies:<br>AB → CD<br>D → C<br>DE → B<br>DEH → AB<br>AC → DC<br>Evaluate the highest normal form. | [5] | CO5 | 5 |

**:::::02/05/2025 E:::::**