

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

CLASS: I.M. Sc
BRANCH: Quantitative Economics and Data Science
(QEDS)

SEMESTER: II
SESSION: SP/2022

SUBJECT: ED119: 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. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) What happens when a derived class inherits from a base class using public, private, and protected keywords? [CO1] [5]
- Q.1(b) What is polymorphism? Describe the taxonomy of the polymorphism. [CO1] [5]
- Q.2(a) Describe Database and Application Architecture diagrammatically. [CO2] [5]
- Q.2(b) Explain the concept of physical data independence and its importance in database systems. [CO2] [5]
- Q.3(a) Consider the database EMPLOYEE [5]
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- employee (person name, street, city)
works (person name, company name, salary)
company (company name, city)
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- Give an expression in the relational algebra to express each of the following queries:
- i. Find the name of each employee who lives in city "Miami".
 - ii. Find the name of each employee whose salary is greater than \$100000.
 - iii. Find the name of each employee who lives in "Miami" and whose salary is greater than \$100000. [CO3]
- Q.3(b) What is the significance of Schema Diagram? Draw the Schema diagram of your university. [CO3] [5]
- Q.4(a) Consider the SQL query [5]
- ```
select p.a1
from p, r1, r2
where p.a1 = r1.a1 or p.a1 = r2.a1
```
- Under what conditions does the preceding query select values of  $p.a1$  that are either in  $r1$  or in  $r2$ ? Carefully examine the cases where either  $r1$  or  $r2$  may be empty. [CO4]
- Q.4(b) Explain the difference between integrity constraints and authorization constraints. [CO4] [5]
- Q.5(a) Consider the schema  $R = (A, B, C, D, E, G)$  and the set  $F$  of functional dependencies: [5]
- ```
A → BC
BD → E
CD → AB
```
- i. Find a nontrivial functional dependency containing no extraneous attributes that is logically implied by the above three dependencies and explain how you found it.
 - ii. Use the BCNF decomposition algorithm to find a BCNF decomposition of R . Start with $A \rightarrow BC$. Explain your steps.
 - iii. For your decomposition, state whether it is lossless and explain why.
 - iv. For your decomposition, state whether it is dependency preserving and explain why. [CO5]
- Q.5(b) Construct an E-R diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted. [CO5] [5]

:25/07/2022: