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Question Paper Code	13972
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B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Third Semester

Information Technology

(Common to Computer Science and Engineering (Cyber Security))

24ITPW301 - DATABASE MANAGEMENT SYSTEMS WITH LABORATORY

Regulations - 2024

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

Marks	K-Level	CO
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|--|---|----|-----|
| 1. A weak entity is an entity that
(a) Attributes not present in the relation
(b) Cannot exist without a related strong entity
(c) Has no relationship with other entities
(d) Can exist without a related strong entity | 1 | K1 | CO1 |
| 2. Multi-value attribute in ER diagram is represented by
(a) Double oval (b) Dash oval (c) Diamond (d) Double rectangle | 1 | K1 | CO1 |
| 3. Identify trivial functional dependency
(a) $A \rightarrow B$ (b) $AB \rightarrow A$ (c) $A \rightarrow AB$ (d) $A \rightarrow B$ and $B \rightarrow A$ | 1 | K1 | CO2 |
| 4. Lossless decomposition ensures that
(a) Information will not loss when relations are joined back
(b) All attributes are unique
(c) No redundant data exists
(d) Foreign keys are preserved | 1 | K1 | CO2 |
| 5. Identify the following not valid PL/SQL data type
(a) Number (b) Boolean (c) String (d) Varchar2 | 1 | K1 | CO3 |
| 6. _____ is used to call a stored procedure
(a) RUN (b) CALL (c) EXECUTE (d) START | 1 | K1 | CO3 |
| 7. ACID properties in transaction means
(a) Accuracy, Clarity, Isolation, Dependability
(b) Atomicity, Consistency, Integrity, Data
(c) Atomicity, Consistency, Isolation, Durability
(d) Accuracy, Clarity, Integrity, Data | 1 | K1 | CO4 |
| 8. _____ is used to
(a) Mark a point in a transaction to roll back to later (b) Commit part of a transaction
(c) Lock a record (d) End a transaction | 1 | K1 | CO4 |
| 9. The purpose of Query compiler is to
(a) Translate to machine language (b) Translate to Relational algebra expressions
(c) Translate to C code (d) Both a & b | 1 | K1 | CO5 |
| 10. Aggregation represents
(a) "As-a" relationship between classes (b) "Is-a" relationship between classes
(c) "Have-a" relationship between classes (d) "Has-a" relationship between classes | 1 | K1 | CO6 |

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

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|--|---|----|-----|
| 11. Construct an ER diagram for Student and Course entities and identify the suitable relationship among them. | 2 | K2 | CO1 |
| 12. Interpret a query to find the minimum and maximum salary of an employee in the table. | 2 | K2 | CO1 |

13. The following functional dependencies hold on a relation U with attributes P, Q, R, S, and T :
 $P \rightarrow QR$
 $RS \rightarrow T$
 Identify the possible functional dependencies can be inferred from the above functional dependencies. 2 K3 CO2
14. Define BCNF with an example. 2 K1 CO2
15. Develop simple PL/SQL block to calculate the area of a circle. 2 K2 CO3
16. Build a cursor to display student names and course names from the STUDENT and COURSE table. 2 K2 CO3
17. Let $r_i(z)$ and $w_i(z)$ denote read and write operations respectively on a data item z by a transaction T_i . Consider the following two schedules.
 $S1 : r_1(x) r_1(y) r_2(x) r_2(y) w_2(y) w_1(x)$
 $S2 : r_1(x) r_2(x) r_2(y) w_2(y) r_1(y) w_1(x)$.
 Justify the following statement True or False with explanation:
 “S1 is not conflict serializable and S2 is conflict serializable” 2 K2 CO4
18. Illustrate the two phases of locking protocol. 2 K2 CO4
19. The following key values are inserted into a B+-tree in which order of the internal nodes is 3, and that of the leaf nodes is 2, in the sequence given below. The order of internal nodes is the maximum number of tree pointers in each node, and the order of leaf nodes is the maximum number of data items that can be stored in it. The B+- tree is initially empty.
 10, 3, 6, 8, 4, 2, 1
 Identify the number of leaf nodes have to split during insertion. 2 K2 CO5
20. Compare Sparse and Dense index. 2 K2 CO5
21. List the components of XML schema. 2 K1 CO6
22. Summarize the advantages of NoSQL database. 2 K2 CO6

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23. a) Construct a three-level architecture model to a University database system with neat diagram. 11 K3 CO1
- OR**
- b) Develop an ER model for a hospital management system. 11 K3 CO1
24. a) Given a relation R(A, B, C, D, E) with the following functional dependencies:
 $F = \{ A \rightarrow B, B \rightarrow C, AC \rightarrow D, D \rightarrow E \}$ Make use of it, to find
 (a) The closure of A (b) All candidate keys of R (c) Decompose R into BCNF. 11 K3 CO2
- OR**
- b) Apply Normalization upto 3NF for a table with the Student ID, Student Name, Dept ID, Dept Name, HOD, HOD phone number. 11 K3 CO2
25. a) Build a PL/SQL program to accept an employee ID and display the employee’s name, job, and salary. If the entered ID does not exist, display an appropriate message using exception handling. 11 K3 CO3
- OR**
- b) Construct a PL/SQL stored procedure named proc_update_salary that accepts an employee ID and a percentage value, and increases the employee’s salary by that percentage. If the employee ID does not exist, display a suitable message using exception handling. 11 K3 CO3

26. a) Model a transaction schedule involving three transactions and determine whether it is conflict-serializable. 11 K3 CO4

OR

b) Apply concurrency control techniques to ensure consistency in a database when multiple users perform deposit and withdrawal transactions simultaneously. 11 K3 CO4

27. a) Assume the concept of B+ Tree indexing to organize and search records efficiently in a database. Explain its structure with an example insertion and search operation. 11 K4 CO5

OR

b) Examine a dynamic hash table for inserting the following student IDs: 5, 7, 15, 23, 31, 39, 46. Show how the directory expands and buckets split step-by-step. 11 K4 CO5

28. a) Analyze object-oriented concepts to design an Object-Based Database System (OODB) for a hospital management system. Include classes, objects, and relationships. 11 K4 CO6

OR

b) Inspect how XML schema (XSD) enforces structural and data integrity constraints in XML databases. Provide examples to justify your analysis. 11 K4 CO6