

**MASTER IN MULTIMEDIA DEVELOPMENT
AND
M. TECH IT (COURSEWARE ENGG) EXAMINATION
First Year - Second Semester - 2024
MANAGEMENT OF SOFTWARE SYSTEM DEVELOPMENT**

TIME: 3 Hours

Full Marks: 100

Answer any **five** questions.

[All the question parts must be answered together]

1. Consider a relational schema R with four attributes (A, B, C, D). For each of the following sets of FDs that hold for R, do the following: 10+10
 - (a) Identify the candidate key(s) for R.
 - (b) Identify the best normal form that R satisfies (1NF, 2NF, 3NF, or BCNF).
 - (c) If R is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies.
 - i. $ABC \rightarrow D, D \rightarrow A$
 - ii. $A \rightarrow B, BC \rightarrow D, A \rightarrow C$

2.
 - a) Prove that $BCNF \Rightarrow 3NF$, but the converse is not true. 5+5+10
 - b) How to check for the lossless join decomposition in a relation?
 - c) Consider a relational schema R (A, B, C, D, E, F) and the set of functional dependencies $\{A \rightarrow BC, B \rightarrow E, CD \rightarrow EF\}$. Prove that the functional dependency $AD \rightarrow F$ holds in R.

3.
 - a) Consider a relational schema R (A, B, C, D, E, G, H) and the set of functional dependencies $(A \rightarrow C, AB \rightarrow C, C \rightarrow DI, CD \rightarrow I, EC \rightarrow AB, EI \rightarrow C)$. Compute the minimal cover for the set of given functional dependencies. [Hints: Mention the inference axioms as and when applied] 10 + 10
 - b) Consider a relational schema R (A, B, C, D, E) and the set of functional dependencies $(A \rightarrow CD, B \rightarrow CE, E \rightarrow B)$.
 - i) Give a lossless join decomposition of R into BCNF.
 - ii) Give a lossless-join decomposition of R into 3NF, preserving functional dependencies

[Turn over

4. a) Explain insertion anomaly with an example in a database. 5+(5x3)
 b) Consider the following relational database consisting of the four relation schemas:
passenger (pid, pname, pgender, pcity)
agency (aid, aname, acity)
flight (fid, fdate, time, src, dest)
booking (pid, aid, fid, fdate)
 Write relational algebra expressions for the following queries.
 i. Find the passenger names of those who do not have any bookings for flights.
 ii. Get the details of all flights from Chennai to New Delhi.
 iii. Find the agency names for agencies located in the same city as the passenger with passenger ID 123.
- 5 a) When are relations said to be union-compatible? 5+5+10
 b) Explain constraints and cardinality ratio in the ER diagram using a suitable example.
 c) Consider the relation R (A, B, C, D, E, F) with the set of functional dependencies (A→C, B→C, C→D, E→F). The decomposed relations are (R1= A, D), (R2= A, B), (R3=B, E), (R4=C, D, E), and (R5=A, E). Check whether the decomposition is lossy or lossless.
6. Consider a database with the following schemas: 5x4
 Sales (sale_id, product_id, quantity_sold, sale_date, total_price)
 Products (product_id, product_name, category, unit_price)
Note: Attributes which are underlined are primary keys
 Construct the following SQL queries for this database.
 a) Lists products with total sales exceeding Rs. 5000.
 b) Determine the average quantity sold for products with a unit price greater than Rs. 5000.
 c) Identify sales where the quantity sold is greater than the average quantity sold.
 d) Retrieve the sale_id and sale_date from the Sales table, formatting the sale_date as 'YYYY-MM-DD'.

7. a) Estimate efforts and duration of the embedded software development project using a Basic COCOMO model with a size of 89 KLOC. How many workers are required for this project? 5+5+5+5
- b) Consider a software project with 5 tasks T1 –T5, and the duration of tasks in weeks are 3, 2, 3, 5 and 2, respectively. Tasks T2 and T4 can start when task T1 is finished. Task T3 can start when task T2 is complete. Task T5 can start when both tasks T3 and T4 are complete. Draw the PERT chart and compute the latest start time of task T3.
- c) Explain briefly the five desirable characteristics of a good Software Requirements Specification (SRS) document.
- a) Explain why the spiral life cycle model is considered a meta-model.
8. Write short notes on (**ANY FOUR**) 5x4
- a) Left Join Excluding Inner Join
- b) McCabe Cyclomatic Complexity
- c) Trigger in SQL
- d) Psuedo transitive rule
- e) Incremental Model