

Instructions to candidates

Answer all questions

Number of questions: Four (04)

Time allocation: Two (02) hours

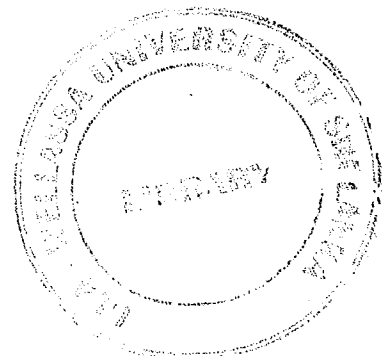
Mark allocation: 100

1.
 - a. What are the ACID properties in database? (4 mark)
 - b. Briefly define two (02) categories of database schemas. (6 mark)
 - c. Write a mechanism which is used by the database administrator to handle the following countermeasures? (6 mark)
 - i. Access control
 - ii. Discretionary authorization
 - iii. Mandatory authorization
 - d. Explain the following with suitable examples. (9 mark)
 - i. CIA security goals of database
 - ii. Access control

2.
 - a. What is the main objective of the normalization? (3 mark)
 - b. Briefly explain three (03) anomalies which can be contained in a database. (6 mark)
 - c. Briefly explain 1NF, 2NF and 3NF? (6 mark)
 - d. Normalize the following Table 1 (ABC (PVT) Ltd Supplier Details) using normal forms with explanations. (10 mark)

PRODUCT	SUPPLIER	PRICE	CITY_CODE	CITY	POPULATION
Tracks	Astra	120000	00001	Colombo	650000
Tracks	SAAB	500000	00002	Kandy	110000
Car	SAAB	150000	00002	Kandy	110000
Car	Volvo	100000	00003	Badulla	48000
Van	Astra	400000	00001	Colombo	650000

Table 1: ABC (PVT) Ltd Supplier Details



3.

- a. Write an advantage of relational algebra in contrast to SQL. (3 mark)
- b. Explain the meaning of given expression: (3 mark)

$\Pi_{\text{student, age, mark}}(\text{Students})$

- c. Briefly explain main differences between the CARTESIAN PRODUCT and NATURAL JOIN? (4 mark)
- d. Write the relational algebra expressions for the following by referring the content of Figure 1 (Students' Expense). (15 mark)
- Select 'Activity' and 'Cost' columns from the Activities table.
 - Rename the above part i resulted table as COST.
 - Select ID of 'John Smith'.
 - Retrieve the activities of 'Mark Antony' where cost is greater than \$15.
 - List the students having cost of \$17 cost for 'Swimming'.

Students Table		Activities Table		
Student	ID*	ID*	Activity*	Cost
John Smith	084	084	Swimming	\$17
Jane Bloggs	100	084	Tennis	\$36
John Smith	182	100	Squash	\$40
Mark Antony	219	100	Swimming	\$17
		182	Tennis	\$36
		219	Golf	\$47
		219	Swimming	\$15
		219	Squash	\$40

Figure 1: Students' Expense

4.

- a. What is the minimal super key? (2 mark)
- b. Give two (02) advantages and two (02) disadvantages of schema combination. (4 mark)
- c. Identify the entities and relationships from the following description and construct the E-R diagram. Clearly indicate all the cardinality ratios, participation constraints in the diagram and mention all the assumptions that you have made. (9 mark)

"Persons, described by their name, SSN and address. They subscribe to various journals. Each journal, identified by a title and an ISBN, has a set of numbered volumes and each of these has a set of numbered issues. Subscribers have an initial subscription date and a termination date for each journal to which they subscribe."

d. Convert the following E-R diagram (Figure 2) into relational schemas.

(10 mark)

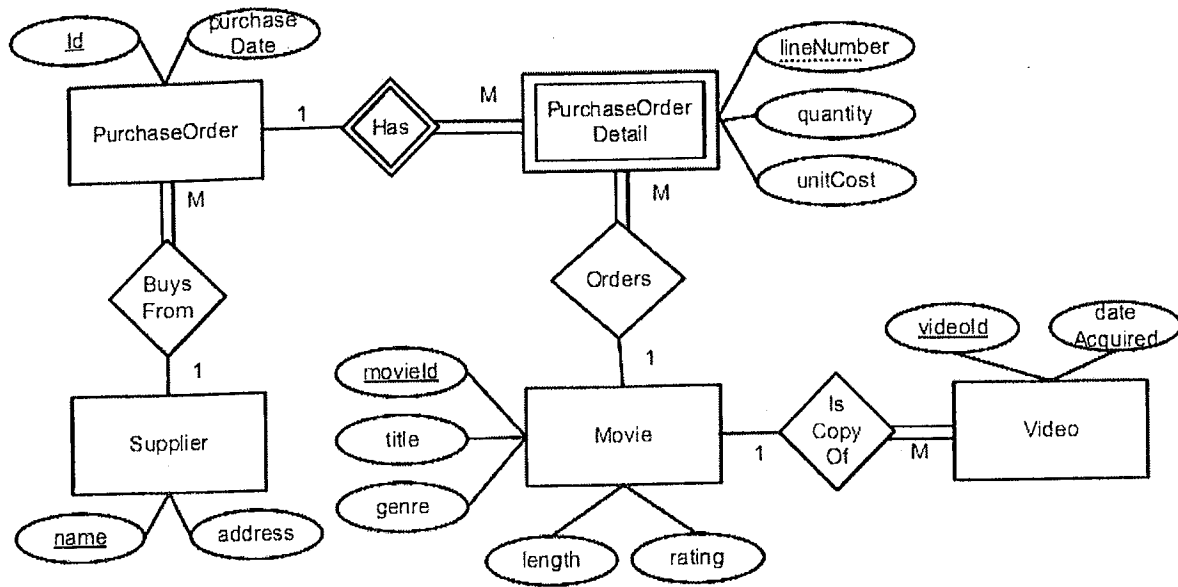


Figure 2: Movie Purchase System

