

**M.Tech. IN ADVANCED INFORMATION  
TECHNOLOGY – SOFTWARE TECHNOLOGY  
(MTECHST)**

**Term-End Examination**

**December, 2014**

**MINI-014 : DATA MANAGEMENT**

*Time : 3 hours*

*Maximum Marks : 100*

**Note :**

- (i) *Section I is **compulsory** and carries maximum 30 marks.*
- (ii) *In Section II, solve any **five** questions. It carries maximum 70 marks.*
- (iii) *Assume suitable data wherever required.*
- (iv) *Draw suitable sketches wherever required.*
- (v) *Italicized figures to the right indicate maximum marks.*

**SECTION I**

**1. Case study : Data requirements for Video Rental Company.**

The video rental company has several branches throughout the country, India. The data held on each branch is the branch address made up of street, city, state and zip code and the telephone number. Each branch is given a branch number,

which is unique throughout the company. Each branch is allocated staff, which includes a manager. The manager is responsible for the day-to-day running of a given branch. The data held on a member of staff is his or her name, position and salary. Each member of staff is given a staff number, which is unique throughout the company. Each branch has a stock of videos. The data held on a video is the catalogue number, video number, title, category, daily rental, cost, status and the names of the main actors and director. The catalogue number uniquely identifies each video. However, in most cases, there are several copies of each video at a branch, and the individual copies are identified using the video number. A video is given a category such as Action, Adult, Children, Drama, Horror, or Sci-Fi. The status indicates whether a specific copy of a video is available for rent. Before hiring a video from the company, a customer must first register as a member of a local branch. The data held on a member is the first and last name, address, and the date that the member registered at a branch. Each member is given a member number, which is unique throughout all branches of the company. Once registered, a member is free to rent video, up to maximum of ten at any one time. The data held on each video rented is the rental number, the full name and number of the member, the video number, title and daily rental, and the dates the video is rented out and returned. The rental number is unique throughout the company.

Answer the following questions :

- (a) Identify the main entity types of the video rental company. 5
- (b) Identify the main relationship types between the entity types described in (a) and represent each relationship as an ER diagram. 5
- (c) Determine the multiplicity constraints for each of the relationships described in (b). Represent the multiplicity for each relationship in the ER diagrams created in (b). 5
- (d) Identify the attributes and associate them with entity or relationship types. Represent each attribute in the ER diagrams created in (c). 2
- (e) Determine the candidate and primary key attributes for each (strong) entity type. 3
2. An enterprise organization is using transactional database systems for their day-to-day business operations. The system is discrete and built separately based on functionality. It has problems like lack of integrated view about business entities, multiple reports with different data formats and coding

standards and delayed report generation. Due to these problems, the business analyst is having problem in data analysis. Hence, the business analyst and the business owner decided to implement any of the following advanced systems :

- ERP
- Data warehouse
- Distributed databases

Identify which of the above systems are good enough for solving the above problems. Explain its advantages, requirements (software/hardware) and implementation criteria.

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## SECTION II

3. (a) What is Query Optimization ? State the heuristics that should be applied to improve the processing of a query. 3+4
- (b) What is Database transaction ? Explain the ACID properties for the transactions in detail. 3+4
4. (a) Write the differences between SDLC and Prototype methodologies for information system development. 7
- (b) What is data modelling ? Can't we create a database without data modelling ? Give reasons. 2+5
5. (a) What is Normalization ? Describe the purpose of Normalization. 3+4
- (b) Describe the concept of multi-valued dependency and describe how this concept relates to 4NF. Provide an example to illustrate. 7
6. (a) What is a Data Warehouse ? Why do we require the Data Warehouse when we have Transactional Processing (TP) systems in place ? 3+4
- (b) Describe how a dimensional model differs from Entity-Relationship(ER) model. 7

7. (a) Explain the database components necessary for query optimization. 7
- (b) Differentiate between structured and semi-structured data. 7
8. (a) What is the difference between COUNT, COUNT DISTINCT, and COUNT (\*) in SQL ? When will these three commands generate the same and different results ? 5+2
- (b) What is the evaluation order for the Boolean operators (AND, OR, NOT) in an SQL command ? How can one be sure that the operators will work in the desired order rather than in this prescribed order ? 7
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