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The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Electrical & Computer Engineering

Study Programme	: Bachelor of Software Engineering Honours
Name of the Examination	: Final Examination
Course Code and Title	**: EEI3266 Information Systems and Data Management**
Academic Year	: 2021/2022
Date	: 8th February 2022
Time	: 0930-1230hrs
Duration	: **3 hours**

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper contains four (04) questions. **ALL FOUR (4) questions are compulsory.**
3. Answer all questions.
4. This is a Closed Book Test **(CBT).**
5. Answers should be in clear handwriting.
6. Do not use red colour pen.

Q1.

i. Describe what is meant by 'Electronic Data Interchange (EDI)' and give one advantage of EDI. **(3 marks)**

ii. Categorize the given Information Systems into the two categories 'Operations Support Systems' and 'Management Support Systems' **(6 marks)**

a) Transaction Processing System
b) Expert System
c) Decision Support System
d) Process Control System
e) Executive Information System
f) Enterprise Collaboration System

iii. Define THREE (3) categories of Data Models and provide ONE (1) example for each of the data model. **(6 marks)**

iv.

a) List FIVE (5) characteristics of Database Systems. **(5 marks)**
b) Describe how the above stated characteristics help to overcome limitations in file-based systems. **(5 marks)**

Q2.

i. List SIX (6) steps in the Database Life cycle. **(3 marks)**

ii. Describe the two types of Relationships between Entities (based on the strength of the relationship) which can be shown in an ER diagram. **(4 marks)**

iii. A small private hospital wishes to computerize its activities. The requirements of this private hospital are as follows:

A hospital has several wards. Each ward may have a number of patients. For each ward a unique ward number, name and the number of beds are recorded. Each ward is staffed by one or more nurses, one of whom is designated to supervise other nurses in that ward. Each nurse is assigned to a single ward. For each nurse, a unique employee number, name and address are recorded.

There are doctors and senior doctors (who are called consultants) in this hospital. Each consultant is responsible for a number of patients and his/her specialization is recorded along with the name and consultant number. Each patient is under the care of a single consultant. Each doctor in the hospital may treat several patients. Each patient may be treated by a number of doctors. For each patient a unique patient number, name (surname and initials), address, contact number and date of birth are recorded. For each treatment the drug code, dosage and the date are recorded.
Each doctor is assigned as a registrar to each ward. The date that he/she was assigned is recorded. For each doctor a unique employee number, name and address are recorded. Each patient has a guardian whose contact number and name are recorded to be contacted in case of emergency. The existence of guardian's details depends on the existence of patient's records.

a) Identify the entities related to the above scenario. **(4 marks)**

b) Identify a recursive / unary relationship. Justify your answer. **(2 marks)**
c) List the weak entities and justify your answer. **(2 marks)**
d) Draw a suitable Entity Relationship diagram (ERD) for the above scenario. Indicate the cardinality and participation for each relationship. State any assumptions you make. **(10 marks)**

Q3. Following is an invoice given by the Nawala Animal Clinic. You may assume that the given pet is brought to the clinic for a treatment at a time. Study the invoice and answer the given questions.

INVOICE

NAWALA ANIMAL CLINIC DATE: JAN 26, 2022

INVOICE # 987

MR. NUWAN PERERA
123, PRINCE RD, NAWALA.

PET	TREATMENT	AMOUNT
TOMMY	RABIES VACCINATION	300.00
	SKIN DISEASE	350.00
	TOTAL	650.00
	TAX (3%)	19.50
	AMOUNT OWING	669.50

i. Identify the attributes that are necessary to generate the above invoice. **(4 marks)**

ii. Identify a primary key and give the schema of a First Normal Form (1NF) relation for the database of the Nawala Animal Clinic based on the above invoice. **(3 marks)**

iii. Identify Functional dependencies between the attributes in the relation created in part (ii). **(4 marks)**

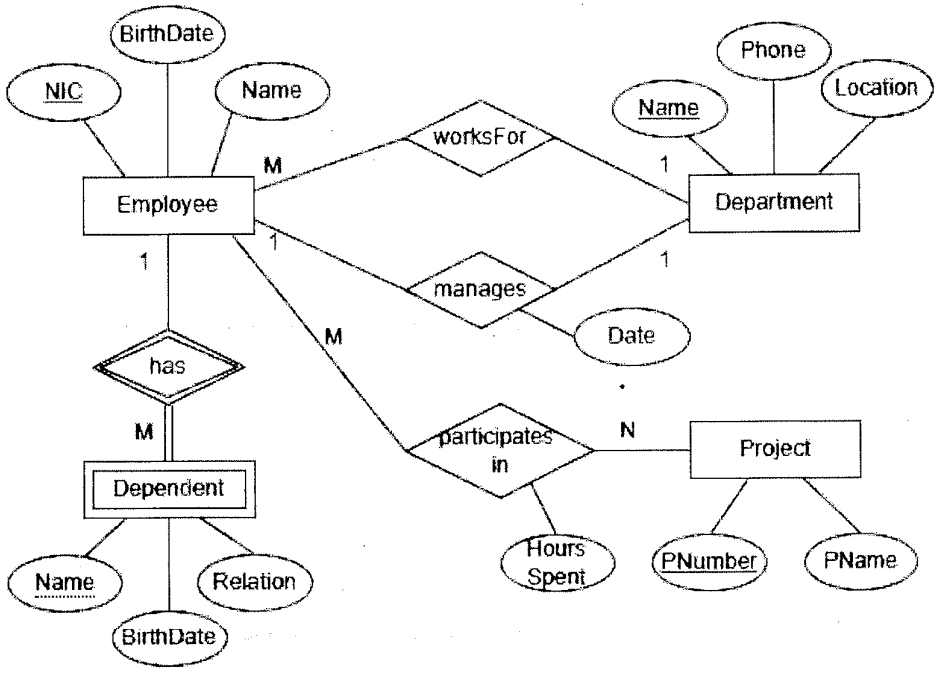
iv. Using the First Normal Form (1NF) relation given in part (ii) discuss TWO (2) Update anomalies found. **(4 marks)**

v. Using the functional dependencies identified in part (iii) decompose the 1NF relation in part (i) into a set of relations in Boyce Codd Normal Form (BCNF). **(6 marks)**

vi. Show how anomalies discussed in part (iv) had overcome in the BCNF relations obtained in part (v). **(4 marks)**

Q4.

i. Map the following Entity Relationship Diagram (ERD) into Relational Schema. Show the reference of each foreign key using an arrow. **(6 marks)**



ii. Using the relational schema developed in part (i), write queries to create relations (tables) with SQL. Use suitable data types to define attributes in each of the relations. Define Primary key/foreign key constraints and other integrity constraints at the creation of relations. **(10 marks)**

iii. Write a SQL query to insert a data point into the relations created. You may use sample data for a relation created in part (ii). **(2 marks)**

iv. Write a SQL query to Select all records pertaining to all the dependents of an employee (given the NIC of that employee). **(1 marks)**

v. Write a SQL query to find the names and respective departments of all employees who are managers of Departments. **(2 marks)**

vi. Write a SQL query to find the maximum number of hours spent by an Employee on a project. **(1 mark)**

vii. Write a SQL query to delete all records of the department of 'Sales' as it no longer exists. **(1 mark)**

viii. Write a SQL query to update the Location of the Department of 'HR' to 'Colombo 05'. **(2 mark)**

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