HARARE INSTITUTE OF TECHNOLOGY

SCHOOL OF INFORMATION SCIENCES AND TECHNOLOGY

B.TECH (HONS) DEGREE IN INFORMATION SECURITY AND ASSURANCE

B.TECH (HONS) DEGREE IN INFORMATION TECHNOLOGY

B.TECH (HONS) DEGREE IN SOFTWARE ENGINEERING

B.TECH (HONS) DEGREE IN COMPUTER SCIENCE

PART 1 SEMESTER 2

ISS 1202: DATABASE DESIGN AND SECURITY

IIT 1202 / ISE1202 / ICS1202: DATABASE SYSTEMS

TIME: 3 HOURS **DATE: JULY 2021**

TOTAL MARKS: 100

INSTRUCTIONS TO CANDIDATES:

- *This question paper contains a total of **FIVE** questions.*
- *Answer **any FOUR** questions.*
- *Each question carries 25 marks*
- *Illustrate your answer, where appropriate with large clearly labelled diagrams.*
- *Start a new question on a fresh page*

ADDITIONAL MATERIALS

- None

QUESTION 1

a. Give the meaning of the following terms with reference to databases:
   i. Constraint [2]
   ii. Entity [2]
   iii. Tuple [2]
   iv. Foreign key [2]
   v. Instance [2]

b. Highlight the main differences between the hierarchical and network models [5]

c. Give a detailed explanation of the database design process [10]

QUESTION 2

a. Differentiate between the following terms
   i. Composite and Simple or Atomic attributes in ERD [2]
   ii. Stored and Derived Attributes in ERD [2]
   iii. Strong entity and weak entity [2]
   iv. Views and Triggers [2]

b. Write a relational algebra expression that can be deduced from the following SQL statements:
   i. SELECT *fname,lname,salary* FROM EMPLOYEE WHERE emp_no is 121 [3]
   ii. SELECT * FROM EMPLOYEE WHERE Dno=4 AND Salary>25000; [2]

c. Discuss the three-schema database architecture [12]

QUESTION 3

a. Consider the following SQL statement and answer the following questions:

```
SELECT customer.LastName, COUNT(Orders.OrderID) As
NumberOfOrders
FROM orders, customer
WHERE customer.customerID = Orders.CustomerID
GROUP BY LastName
HAVING COUNT(Orders.OrderID) > 2021;
```

   i. What is the purpose of the **COUNT** function [2]
   ii. What is the implication of **AS** keyword [2]
   iii. Give reason(s) of using **HAVING** command in that query statement [2]
   iv. Explain the use **GROUP BY** command [2]
   v. Modify the given SQL query so that it shows the orders for customers called 'Johnson' regardless of number of orders made [4]

b. A Shop Owner needs a database called my_shop which has two tables like the ones used in part 4(a), to manage his shop.
   i. Write Structured Query language statements to create a schema, required tables and insert into customer, while observing the following rules:
      - PK and FK with a cardinality ratio of 1:N. between the two tables
      - Foreign key constraints with CASCADE action on update/delete in orders. **[10]**
   ii. Using Chen's notations draw the ERD for the above scenario **[3]**

QUESTION 4

a. Suggest **two** (2) rules for defining a Primary key: **[2]**
b. Give any **three** (3) examples of metadata tags that are found in File Systems: **[3]**
c. Enumerate any **four** (4) tasks/commands that come under any of the database language (SQL) types **[2]**
d. Write a short note on Functional dependence, with proper examples highlight its usage in database development. **[8]**
e. Discuss the concept of Normalization up to Third Normal form and give the normalized version as tables of table 1: **[10]**

Table 1: Customer-Orders

Eric Cartman	1 vanilla, 2 chocolate	12/1/11	101 Main St
Bart Simpson	10 chocolate, 10 vanilla, 5 strawberry	12/3/11	202 School Ln
Stewie Griffin	1 rocky road	12/3/11	303 Chestnut St
Bart Simpson	3 mint chocolate chip, 2 strawberry	12/5/11	202 School Ln
Hank Hill	2 coffee, 3 vanilla	12/8/11	404 Canary Dr
Stewie Griffin	5 rocky road	12/10/11	303 Chestnut St

QUESTION 5

a. Explain what is meant by a transaction. **[2]**
b. Why are transactions important units of operation in a DBMS? **[5]**
c. Describe how commit and rollback actions operate. **[6]**
d. Describe the ACID properties of a transaction **[8]**
e. Explain why it is important for a multi-user DBMS to provide a recovery **[4]**

.....END OF EXAMINATION PAPER.....