NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF INDUSTRIAL TECHNOLOGY

DEPARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING

COMPUTER APPLICATIONS

TIE 2109

Main Examination Paper

December 2014

This examination paper consists of 5 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements:

Examiner's Name: Engineer LungileNyanga

INSTRUCTIONS

1. Answer any five (5) questions.
2. Each question carries 20 marks.
3. Use of calculators is permissible.

Question 1

(a) State any four components of a Database Management Systems (DBMS) environment.[4]

(b) Briefly explain the interactions of each of the four main categories most catered for by most existing Database Management Systems (DBMSs). [8]

(i) Data definition
(ii) Data maintenance
(iii) Data retrieval
(iv) Data control

(c) What is the difference between Database Definition Language (DDL) and Database Manipulation Language (DML)? [8]

Question 2

(a) What does the acronym CAE stand for? [1]

(b) Identify three types of database models and briefly explain each type. [9]

(c) Figure Q2 below shows how the CAD/CAM and CAE activities are integrated through the database which is the objective of computer integrated manufacturing (CIM).

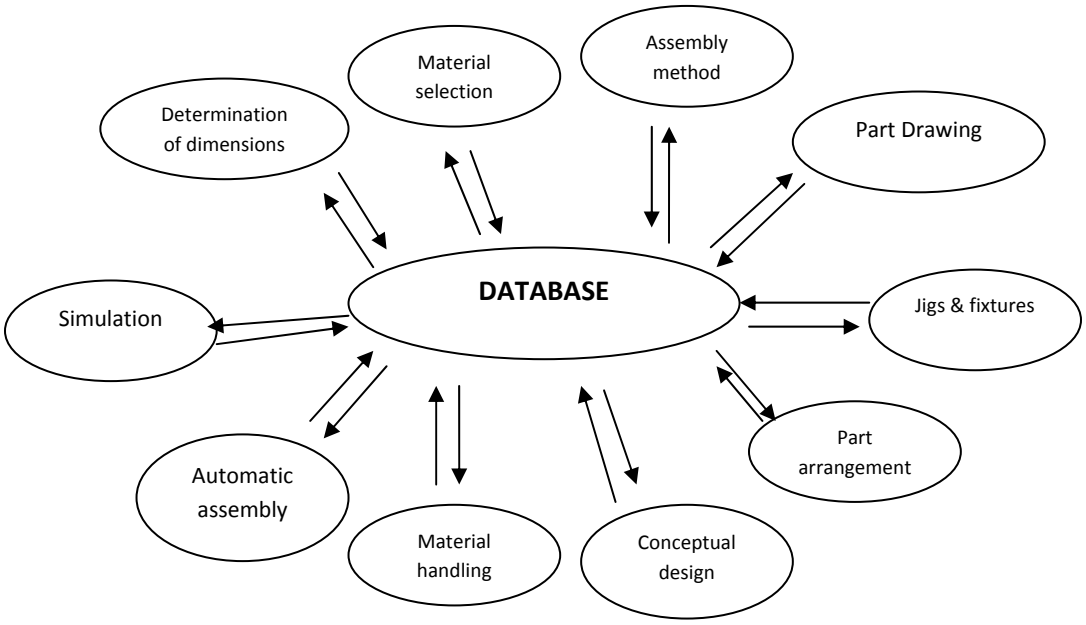

Figure Q2: Integration of CAD/CAM and CAE activities through a database

Use the information flow shown in Figure Q2 to explain the role of engineering information modelling. Use the appropriate modelling platforms which enable the successful realization of such kind of computer integration. [10]

Question 3

(a) Define each of the following relationships with the aid of well labeled diagrams. [6]
   (i) Ternary
   (ii) Recursive

(b) Write syntax to illustrate how each of the following Data Manipulation Language (DML) statements are used: [9]
   (i) SELECT,
   (ii) INSERT,
   (iii) UPDATE.

(c) How does the organization of hierarchical data files differ from the organization of relational data files? [5]

Question 4

The academic world is an interesting example of international cooperation and exchange. This problem is concerned with modelling of a database that contains information on researchers, academic institutions, and collaborations among researchers. A researcher can either be employed as a professor or a lab assistant. There are three kinds of professors: Assistant, associate, and full professors. The following should be stored:

- For each researcher, his/her name, year of birth, and current position (if any).
- For each institution, its name, country, and inauguration year.
- For each institution, the names of its schools (e.g. School of Law, School of Business,
- School of Computer Science, etc.). A school belongs to exactly one institution.
- An employment history, including information on all employments (start and end date, position, and what school).
- Information about co-authorships, i.e., which researchers have co-authored a research paper. The titles of common research papers should also be stored.
- For each researcher, information on his/her highest degree (BSc, MSc or PhD), including who was the main supervisor, and at what school.
- For each professor, information on what research projects (title, start date, and end date) he/she is involved in, and the total amount of grant money for which he/she was the main applicant.

Draw an E/R diagram for the data set described above. Make sure to indicate all cardinality constraints specified above. The E/R diagram should not contain redundant entity sets, relationships, or attributes. Also, use relationships whenever appropriate. If you need to make any assumptions, include them in your answer. [20]

Question 5

(a) Identify a category of engineering applications that rely on XML for conceptual data modeling. [1]

(b) Write XML code to represent *"Customer Order" and "Part"* instances for an advanced production planning system implemented on an XML platform. Use arbitrary figures as values for the entities of the instances. [7]

(c) Explain the applications of Real Time Databases in the following systems;

(i) Telecommunication systems [4]

(ii) Control systems [4]

(iii) e-Commerce and e-business [4]

Question 6

(a) What does the acronym SQL stand for? [1]

(b) In a database of a car Spares Company are records for Orders and Salesperson as shown in the two tables below:

Table Q6(a):Salesperson

ID	Name	Age	Salary
1	Abe	61	1400
2	Bob	34	440
5	Chris	34	400
7	Dan	41	520
8	Ken	57	1150
11	Joe	38	380

Table Q6(b):Orders

Number	order_date	cust_id	salesperson_id	Amount
10	8/2/96	4	2	540
20	1/30/99	4	8	1800
30	7/14/95	9	1	460
40	1/29/98	7	2	2400
50	2/3/98	6	7	600
60	3/2/98	6	7	720
70	5/6/98	9	7	150

Write an SQL code that can be used to retrieve the names of all salespeople that have more than one order from the tables above. You can assume that each salesperson only has one ID. [7]

(c) Using a product of your choice, explain the use of databases in Product Lifecycle Management (PLM). [12]

Question 7

(a) State the five classes of intelligent agents. [5]

(b) Why is the Real Time Database Model the preferred choice for Artificial intelligence (AI) based systems? [5]

(c) Write a C++ program to display the following report shown in Figure Q7; [10]

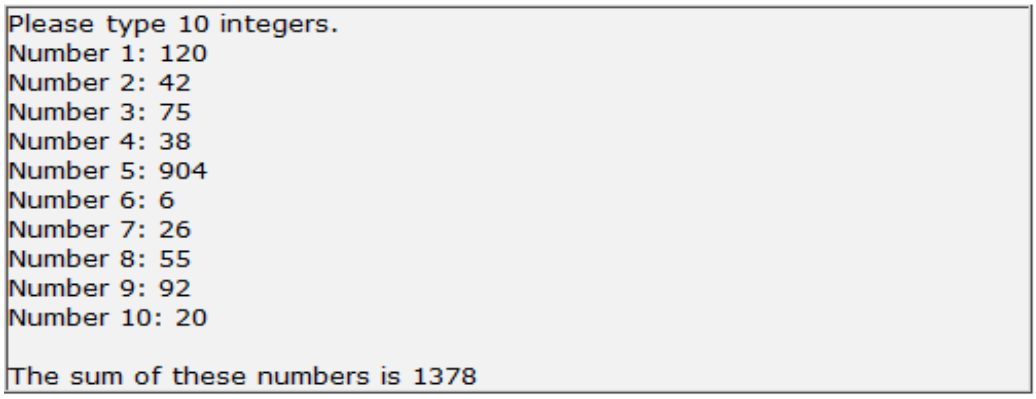

Figure Q7: Report output

End of examination paper