NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF INDUSTRIAL TECHNOLOGY

DEPARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING

MASTER OF ENGINEERING DEGREE IN MANUFACTURING SYSTEM/ENGINEERING AND OPERATIONS MANAGEMENT

MANUFACTURING INFORMATION AND DATABASE SYSTEMS

TIE 6110

First Semester Supplementary Examination Paper

August 2015

This examination paper consists of 4 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: N/A

Examiner's Name: N. Gwangwava & L. Nyanga

INSTRUCTIONS

1. Answer any four (4) questions, two (2) questions from each section
2. Each question carries 25 marks
3. Use of calculators is permissible

MARK ALLOCATION

QUESTION	MARKS
1.	**25**
2.	**25**
3.	**25**
4.	**25**
5.	**25**
6.	**25**
TOTAL	**100**

SECTION A

Question 1

a) State and explain six major questions that should be considered when selecting a database management system (DBMS). [12]
b) Identify three types of database models and briefly explain each type. [9]
c) Use the Unified Modeling Language (UML) concept to illustrate *'aggregation'* based on a product structure of your own choice. [4]

Question 2

a) Explain the meaning of *'cyber-physical production systems'*. [6]
b) Products with integrated dynamic digital storage, sensing and wireless communication capabilities can exhibit three useful characteristics during their life cycle. Identify and explain the importance of these characteristics. [6]
c) With reference to Fig Q2c, describe and explain the significance of industry 4.0 in boosting the economy of a nation. [13]

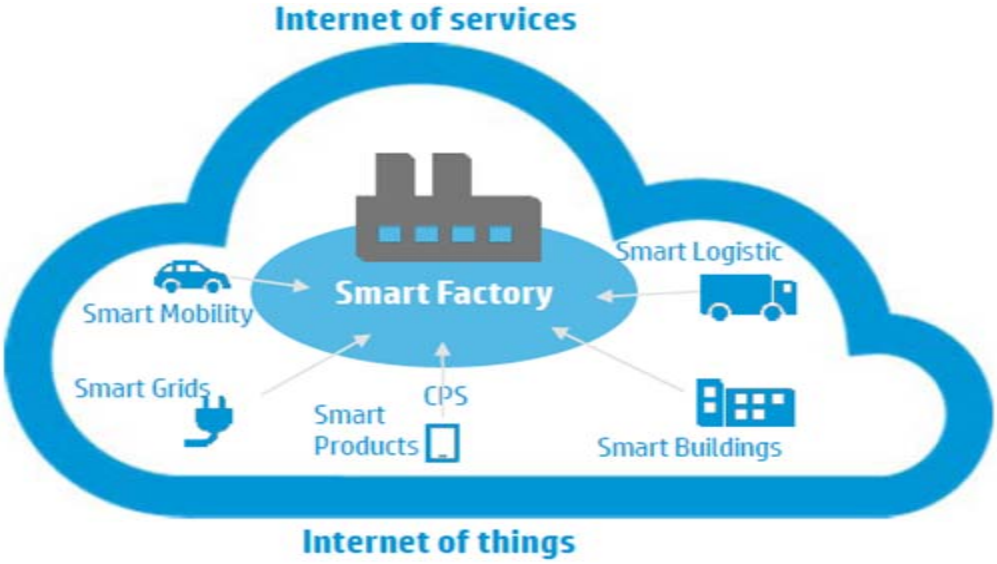

Fig Q2c: Industry 4.0

Question 3

a) What does the acronym STEP stand for? [2]
b) Explain the importance of STEP- ISO 10303-239 in product life cycle support (PLCS), using an engineering product of your choice. [8]
c) Identify a category of engineering applications that rely on XML for conceptual data modeling. [2]

d) 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. [13]

SECTION B

Question 4

a) Data transfer can be measured in three ways. Describe the following measures
   i. Bandwidth, [2]
   ii. Throughput, [2]
   iii. Goodput. [2]

b) Describe the construction and uses of the following copper cables
   a. Coaxial, [4]
   b. Shielded Twisted-Pair (STP). [4]

c) Discuss the Computer Protocols giving an example on their applicability
   i) Simple Mail Transfer Protocol (SMTP), [3]
   ii) File Transfer Protocol (FTP). [3]

c) What is meant by the term network topology? [1]
d) Give brief descriptions of the following LAN topologies:
   i. Bus, [2]
   ii. Star. [2]

Question 5

a) Your company wants to setup a network to run a SCADA system. Your section manager consults you on advice on which software to purchase. What are the features of software will you consider when giving the advise. [7]
b) Briefly describe three types of protocols that you know. [6]
c) Describe briefly the following concepts of Artificial Intelligence:
   i) Characteristics, [4]
   ii) Components, [4]
   iii) Areas of application. [4]

Question 6

The following scenario relates to a set of networks for a pen manufacturer.

i) The organization has four departments.

ii) The marketing department consists of ten personal computers, a shared laser printer and shared marketing programs and data files. It is necessary that the marketing department accept outside inquiries from sales representatives.

iii) The design department consists of six personal computers, a shared printer, and shared program and data files. The design department sometimes sends its in-progress work to the marketing department for their evaluation; similarly, the marketing department sends new ideas to the design department. In addition to communicating with each other, both marketing and design occasionally need to communicate with the mainframe computer.

iv) Users in the purchasing, administrative and personnel departments have terminals attached directly to the mainframe computer. The mainframe computer is connected to the mainframe at the headquarters in another country.

You are required to:

a) Illustrate, using a diagram, how the networks for the different parts of the system may be set up with the different pieces of hardware and connections needed. [9]

b) Write a description of the functions of each of the network devices used. [8]

c) With the aid of suitable examples describe the differences between simplex, half duplex and full duplex transmission. [8]