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 Main Examination Paper

December 2014

This examination paper consists of 5 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

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Question 1

a) Use the Unified Modeling Language (UML) concept to illustrate the following types of aggregation based on product structures of your own choice.

    i.   Composition,   [3]

    ii.   Recursive Aggregation.   [4]

b) Explain the difference between EXPRESS and EXPRESS-G as used in engineering data modeling.   [6]

c) State and briefly explain the functions of any six sub-systems of a computer integrated manufacturing (CIM) system.   [12]

Question 2

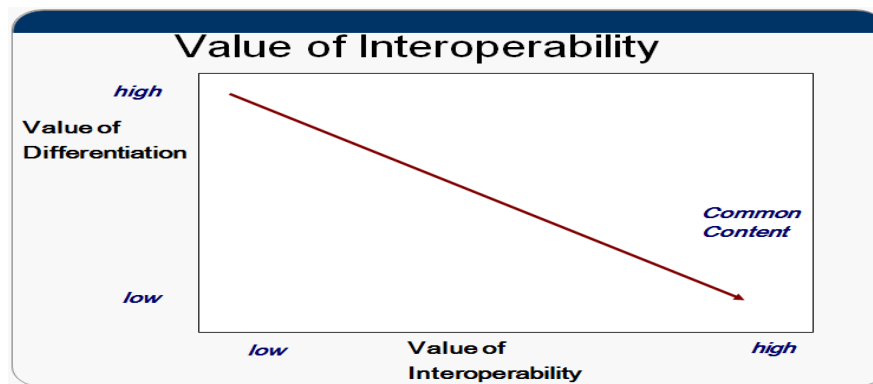a) Explain the benefits of standardization with reference to the graph in Fig Q2a.   [6]

Fig Q2a: Interoperability value graph

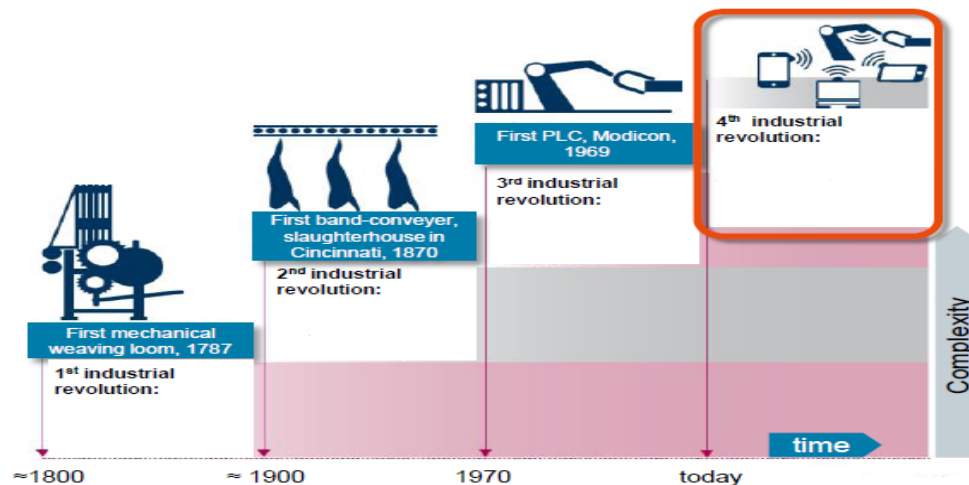b) Describe and explain the evolution of industry with reference to Fig Q2b below.   [10]

Fig Q2b: Industrial revolution

c) With reference to Fig Q2c, explain how cyber-physical production systems can improve efficiency in modern production planning and control. [9]
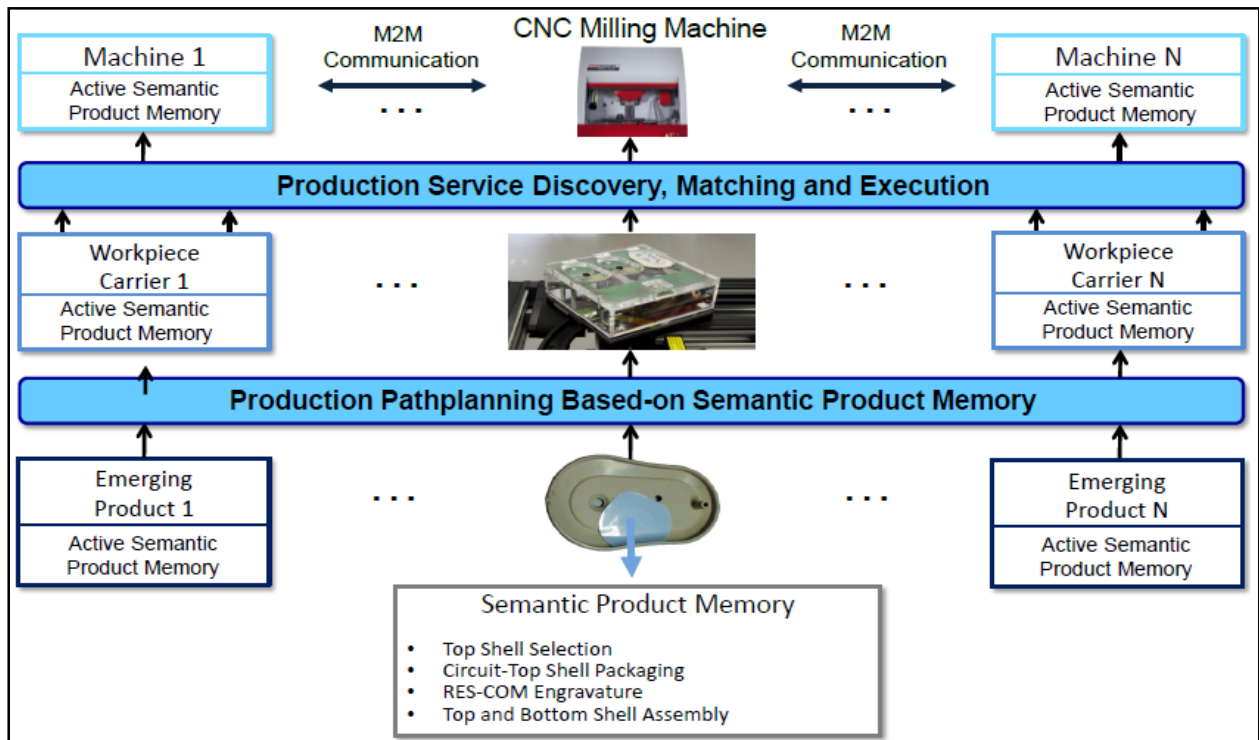

Fig Q2c: Key components of service-oriented cyber-physical production systems

Question 3

a) Identify a category of engineering applications that rely on XML for conceptual data modeling. [3]

b) Draw an EXPRESS-G model diagram to illustrate milling activities in STEP-NC. [12]

c) Write XML code for the tool selection instance example in STEP-NC for milling. [10]

SECTION B

Question 4

a) How would you recommend Operation Systems? [6]

b)   Briefly explain the following terms:
    i)   Multiprogramming, [2]
    ii)   Multitasking, [2]
    iii)   Multiprocessing. [2]

c)   What are the characteristics of an assembly language? [4]

d)   Why would you recommend your company to implement an ERP system? [4]

e)   Discuss the following terms in security:
    i)   Firewall, [3]
   ii)   Encryption. [2]

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Question 5

a) Give a brief description of the application and limitations of the following types of
    transmission media giving areas of application.
    i)   UTP,   [4]
    ii)   Multimode Optic Fibre,   [4]
    iii)   Wireless.   [4]
b) Explain the difference between a switch and a hub   [4]
c) What are the advantages of a Star LAN topology over a Mesh LAN topology?   [4]
d) Ethernet uses Carrier Sense Multiple Access with Collision Detection (CSMA/CD) to
    detect and handle collisions and manage the resumption of communications. Briefly
    explain the concept of CSMA/CD.   [5]

Question 6

You work for a multinational company with headquarters in Sydney and regional headquarters in
Atlanta, Perth and Corpus. Your IT manager has given you the task to set up a network for the
company as shown in Figure Q6.

The information on the number of hosts in each LAN is as follows:
* 1st subnet, AtlantaHQ 62 host addresses,
* 2nd subnet, CorpusHQ 40 host addresses,
* 3rd subnet, SydneyHQ 20 host addresses,
* 4th subnet, PerthHQ 10 host addresses,
* 5th subnet 6 WAN point-to-point link addresses.
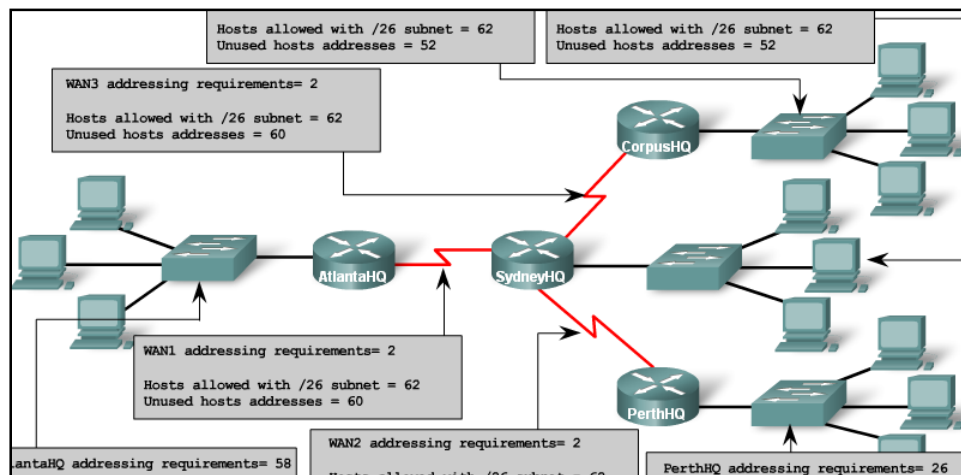
Figure Q6 Company network

IP address assignments are:
  i. For the server, configure the second highest usable IP address on the SydneyHQ subnet.
  ii. For Router1's Fa0/0 interface, configure the highest usable IP address on the AtlantaHQ subnet.
  iii. For Router1's S0/0/0 interface, configure the highest usable IP address on the existing WAN subnet.
  iv. For Router2's S0/0/0 interface, use the lowest usable address on the existing WAN subnet.
  v. For Router2's Fa0/0 interface, use the highest usable address on SydneyHQ.

  a) Fill up the network table showing the subnets, network address, host range, broadcast address and subnet mask for each subnet. Show your working.   [20]
     Table Q6: Network details

Subnet No	Network Address	Host Range	Broadcast Address	Subnet Mask
1				
2				
3				
4				
5				

  b) Complete the table below showing the IP addresses of the Routers.   [5]
     Table Q6b: IP addresses of the Routers

Device	Interface	IP Address
Router1	Fa0/0	
	S0/0/0	
Router2	Fa0/0	
	S0/0/0	
Server	NIC	