National Exams May 2009

98-Ind-B8, Computer Integrated Manufacturing (CIM)

3 hours duration

NOTES:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.

2. This is an OPEN BOOK EXAM.
   Any non-communicating calculator is permitted.

3. FIVE (5) questions constitute a complete exam paper.
   The first five questions as they appear in the answer book will be marked.

4. Each question is of equal value.

5. Most questions require an answer in essay format. Clarity and organization of the answer are important.

98-Ind-B8, Computer Integrated Manufacturing (CIM)

QUESTION # 1:

1) Define CIM?
2) What are the main fundamental concepts, philosophy and requirement for Computer Integrated Manufacturing?
3) What are the various types of Integration in CIM?
4) Give examples for the various types of Integration in CIM?

QUESTION # 2:

You must be able to understand a manufacturing process before you can automate it. You are required to explain one of the following manufacturing processes, and the various components. The explanation must be in your own words. Illustrate your example with block diagrams clearly indicating the process, the material flows and the data flows. Indicate the inputs and outputs, critical key characteristics and any other relevant information pertinent for design development, management and control.

1. Explain briefly what is meant by Computer Integrated Manufacturing (or CIM) and distinguish it from Computer Aided Manufacturing (or CAM).
2. Discuss the role of the computer tools in the selected manufacturing process. Summarize your findings clearly and concisely.
3. What database model(s) would you use and why?
4. What networking strategy would you use and why?

QUESTION # 3:

Identify the stages of the design process, and describe the CAD / CAM / CAE design tools that would be used through the initial product conception to the final commercial product for two distinct industrial sectors. Compare and contrast. Discuss the product and process design aspects. Clearly indicate the tools to be used, and for what reasons. What are the challenges that need to be overcome?

Points of discussion:

Distribution of engineering activities

Appropriate design and analysis tools for various tasks

Internal representation of data

Data translation issues and strategies (hint: STEP)

QUESTION # 4:

Define and illustrate the difference, including with the aid of diagrammatic sketches, the following in relation to manufacturing databases:

- Collection of independent databases
- Centralized database
- Interfaced databases, and
- Distributed databases

QUESTION # 5:

a) Discuss and illustrate with examples and sketches the concept of hierarchical computer control for manufacturing. Include the definitions, functions and differences between the control strategies and implementations at the following levels: Machine control; Plant Floor control; Plant control; corporate control.

b) Discuss and illustrate the decline of the value of information over time for the four different control levels.

QUESTION # 6:

Computer Integrated Manufacturing (CIM) is a term that is used by industry to cover a broad range of technologies used to increase the cost effectiveness of products and plants. The definition of CIM depends on the organization and industry. One common aspect of the CIM is the concept that the processes function under computer control with digital information tying them together.

Select a 'multiple components' product or product family to illustrate your answers where appropriate.

QUESTION # 7:

Today there are a large number of different control systems used in manufacturing automation, these include: NC, CNC, DNC, etc. The controls may also be in real-time, near real-time; it may sequential or parallel.

Define and differentiate between these, including hardware and software features and functions needed. With the aid of schematic diagrams, illustrate the functional control for: i) an NC machine tool, and ii) one example in manufacturing control of your choice.