THE OPEN UNIVERSITY OF SRI LANKA

FACULTY OF ENGINEERING TECHNOLOGY

BACHELOR OF TECHNOLOGY – LEVEL 06

FINAL EXAMINATION – 2005/2006

MEX6334 / MEU4304 – ADVANCED MANUFACTURING TECHNOLOGY

042

DATE : ***MARCH 13, 2006***

TIME : ***0930 HRS. – 1230 HRS.***

DURATION : ***THREE HOURS***

PLEASE READ THE FOLLOWING INSTRUCTIONS BEFORE ANSWERING THE PAPER

INSTRUCTIONS:

1. *This paper is of closed book type.*
2. *This paper consists of eight questions.*
3. *You are required to answer any **five questions only**.*
4. *Answers should be written on the answer books provided by the Examinations Division.*

Question 01

(1.1) List the types of manufacturing industries and discuss the applicability of computer integration for such industries.

(06 marks)

(1.2) Discuss the evolution stages of automation. Give examples for each stage.

(06 marks)

(1.3) "CAPP is a typical example of an indirect application of computers in automation". Explain what is understood by "CAPP" and discuss the approaches taken in developing CAPP systems in industry.

(08 marks)

(Cont...)

Question 02

(2.1) Define "Computer Integrated Manufacture" (CIM) and discuss how it can be used to rectify some of the problems encountered in islands of automation?

(07 marks)

(2.2) Discuss at least (5) five benefits that can be achieved by successfully implementing CIM.

(05 marks)

(2.3) Discuss the different levels of integration of CIM in an enterprise.

(08 marks)

Question 03

(3.1) "Across the wall" method of engineering product design is very much outdated today". Explain and discuss the new trend in design practice employed in the modern world.

(08 marks)

(3.2) One of the goals in introducing new trends in design approaches is to improve the interaction between various departments in an enterprise. Explain.

(06 marks)

(3.3) What are the major challenges that need to be addressed before implementing such new design approaches in an enterprise?

(06 marks)

Question 04

(4.1) What is a "turnkey system"? In some cases turnkey systems may not be the best for a CAD situation" Explain.

(06 marks)

(4.2) How do different CAD/CAM systems communicate with each other. Explain all components / elements in these systems.

(06 marks)

(4.3) FEA applications play a major role in CAD for analyzing complex design problems. However, it has some inherent drawbacks when analyzing, especially giving rise to unreliable data out-put. What are the causes for this drawback?

(08 marks)

(Cont...)

Question 05

(5.1) What are the major components of a NC machine system? Briefly describe the functions of each component.

(05 marks)

(5.2) Discuss the different types of motion control systems found in NC systems and indicate the suitability of each system.

(07 marks)

(5.3) Explain with the aid of neat sketches the primary and auxiliary axes of motion in relation to a CNC machine centre. Indicate clearly the positive and negative motion.

(08 marks)

Question 06

(6.1) Explain what is meant by Hybrid CNC and Straight CNC. What lead to the development of such systems?

(07 marks)

(6.2) Direct Numerical Control (DNC) is when a number of machine tools are controlled in real time using a computer. Discuss the alternative system configurations by which the communication link is established between the control computer and the machine tools.

(07 marks)

(6.3) Adaptive Control (AC) can be successfully employed to control machine tools when sources of variability are high. Discuss these sources of variability.

(06 marks)

Question 07

(7.1) What is a Flexible Manufacturing System (FMS)? Discuss the sub-systems in a FMS *(06 marks)*

(7.2) Eventhough all major elements inherent to FMS is present within a manufacturing environment, it does not necessarily mean that it forms a FMS. If so, what are the factors that make them flexible?

(08 marks)

(7.3) What advantages does FMS s offer? Discuss.

(06marks)

(Cont...)

Question 08

(8.1) Using R=revolute and P=prismatic, kinematically describe the following basic robot geometries.

(i) Cartesian

(ii) Cylindrical

(iii) Spherical

(iv) Articulated

(v) SCARA

(05 marks)

(8.2) Explain the technical features that are to be taken into consideration when selecting a robot for a particular application.

(07 marks)

(8.3) Explain the terms, "Serviceability", "Modularity" and "Dexterity" in the context of an Industrial Robot.

(08 marks)

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