City & Guilds

9210-225
Level 7 Graduate Diploma in Engineering
Advanced manufacturing technology

Sample Paper

You should have the following for this examination
- one answer book
- non-programmable calculator

No additional data is attached

General instructions
- This paper consists of **eight** questions.
- Answer **five** questions.
- All questions carry equal marks. The maximum marks for each section within a question are shown.
- Use large, clearly labelled diagrams or sketches whenever these will help your answers.

1 a) Discuss briefly the characteristics of manufacturing industry in relation to modern industrial environment (World-class manufacturing). Discuss the applicability of computer integration for such industries. (7 marks)

b) Explain the concept of Computer Integrated Manufacturing (CIM) and reasons for its implementation in a competitive manufacturing environment. (7 marks)

c) What are the major challenges faced by an industry when trying to implement CIM? (6 marks)

2 a) What are the objectives of cellular manufacturing? Explain the different types of machine cell designs. (7 marks)

b) Explain how Flexible Manufacturing System (FMS) differ from a Flexible Manufacturing Cell (FMC). Describe the various layouts used in FMS. (8 marks)

c) What are the different types of flexibilities associated with a manufacturing system in relation to FMC/FMS? (5 marks)

3 a) What is 'Design for Manufacturing and Assembly' and why is it important to engineers? How do computers assist in improving DFM/A? (7 marks)

b) Define Group Technology (GT). Differentiate between product layout and group technology layout. Also state the main hurdles in its implementation. (8 marks)

c) What is Computer-aided process planning (CAPP)? State the advantages of CAPP systems over traditional process planning systems. (5 marks)

4 a) Explain the known types of geometric representation systems used in CAD. Explain their pros and cons. (6 marks)

b) 'FEA applications have become a vital component in CAD environment'. Elaborate on this statement by taking suitable examples. (7 marks)

c) Explain the difference between NC and CNC technology. State the general characteristics of products to be manufactured using NC machines. (7 marks)

5 a) Discuss the evolutionary stages of automation. Elaborate each stage by taking suitable examples. (5 marks)

b) Why are robots used in industry and what makes an industrial robot different from other forms of automated equipment used in manufacturing industries? (7 marks)

c) Describe the principle and purpose of adaptive control. Give some examples where AC is most suited for manufacturing process. (8 marks)

6 a) Explain the principles and the methods of the rapid prototyping. State the advantages and limitations of rapid prototyping. (6 marks)

b) Explain how you will extend reverse engineering to value engineering and value analysis. (7 marks)

c) Discuss briefly the advantages and disadvantages of CMM and explain the role of CMM in Computer Aided Quality Control. (7 marks)

7 a) Explain the process of high energy beam machining. Describe concept of laser machining of non-metallic materials and give several examples for possible applications. (7 marks)

b) What is the difference between High Speed Milling (HSM) and High Performance Machining (HPM)? (7 marks)

c) Discuss the advantages and disadvantages of using surface versus bulk micromachining. (6 marks)

8 a) Discuss the most significant factors that cause tool wear and explain why cutting tool failure is difficult to predict. (6 marks)

b) Discuss economic aspects of selecting proper materials in a suitable manufacturing industry. Elaborate your answer by giving a suitable example. (7 marks)

c) What are the costs involved in manufacturing? Discuss each of them taking suitable example. (7 marks)