Question Paper

Module 6:	**Power and Automation**	
Date:	Time:	Duration:
13 May 2015	**09:30 – 12:00**	**2½ hours**

You should have the following for this examination: **one answer book; pencil, pen and ruler.**

All questions carry equal marks. The maximum marks for each section within a question are shown. Answer **ALL SEVEN** questions, starting each new question (1-7) on a **new** page of the answer book.

1. a) **Explain the difference between a mechanised mill and an automated mill.** (2 marks)

b) **State SIX advantages of a fully automated mill.** (6 marks)

c) **State what is measured in EACH of the following units:** (4 marks)

i) Volts;

ii) Ohms;

iii) Amps;

iv) Watts.

2. a) **i) When designing a mill's electrical distribution system, describe the first planning stage.** (3 marks)

ii) Explain how diversity is applied when designing an electrical distribution system. (3 marks)

b) **Define the term "Power Factor".** (1 mark)

c) **State the main causes for low power factor and how they may be corrected.** (3 marks)

d) **Explain why low power factor should be corrected.** (2 marks)

3. a) **Describe a three-phase squirrel cage motor.** (2 marks)

b) **With the aid of sketches, describe THREE types of drive belt that could be used to transmit power.** (6 marks)

c) **i) Sketch and label the main parts of a roller chain.** (2 marks)

ii) Explain why it is important that a roller chain is correctly tensioned. (2 marks)

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4. **a)** **Describe the significance of terminal velocity in pneumatic conveying systems.** (2 marks)

b) **Describe BOTH a positive pressure conveying system AND a negative pressure conveying system, fully explaining the differences between them.** (8 marks)

c) **Describe how manually to balance a negative pressure conveying system.** (2 marks)

5. **a)** **i) Explain why it is essential to measure position.** (2 marks)

ii) Describe THREE milling examples of where it is essential to measure position. (3 marks)

iii) Describe THREE devices used to measure position. (3 marks)

b) **Describe the FOUR main forms of Tachometer.** (4 marks)

6. **a)** **With the aid of sketches, describe how plant is controlled by:**

i) Traditional relay-based controls; (4 marks)

ii) Programmable Logic Control (PLC). (4 marks)

b) **State the main differences between PLC and relay control systems.** (3 marks)

c) **State the TWO advantages of using PLC in the mill.** (1 mark)

7. **a)** **Describe the TWO main types of digital processor.** (4 marks)

b) **i) With the aid of a sketch, describe the design of a complete process control system;** (3 marks)

ii) Describe how remote parts of the process can be controlled in this system. (3 marks)

c) **State FOUR other devices that may be connected to the data highway.** (2 marks)