

**POLITEKNIK**  
Jabatan Pengajian Politeknik

EXAMINATION AND EVALUATION DIVISION  
DEPARTMENT OF POLYTECHNIC EDUCATION

(MINISTRY OF HIGHER EDUCATION)

MECHANICAL ENGINEERING DEPARTMENT

FINAL EXAMINATION  
JUNE 2012 SESSION

**J5800: INSTRUMENTATION & CONTROL**

DATE : 24 NOVEMBER 2012 (SATURDAY)

DURATION : 2 HOURS (8.30 AM - 10.30 AM )

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This paper consists of **FOUR (4)** pages including the front page.  
(**SIX(6)** Structured questions-Answer **FOUR(4)** question only)

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J5800: Instrumentation & Control

**ESSAY (100 marks)**

**INSTRUCTION:**

This section consists of **SIX (6)** questions. Answer only **FOUR (4)** questions.

**QUESTION 1**

- (a) Define instrumentation and state **FOUR (4)** basic purposes of instrumentation. (12 marks)
- (b) List **THREE (3)** transducer categories. (3 marks)
- (c) The Dead Weight Tester is used as a laboratory standard for calibration of pressure-measuring device. Sketch and explain how Dead Weight Tester is used to calibrate a pressure gauge. (10 marks)

**QUESTION 2**

- (a) List **FOUR (4)** types of measurement in industrial application. (4 marks)
- (b) Explain with the aid of a simple diagram, the operation of ultrasonic flow meter and give **TWO (2)** advantages and disadvantages. (12 marks)
- (c) Sketch and explain capacitive level sensor working principle. (9 marks)

**QUESTION 3**

- (a) State ONE (1) example of instrument system using mechanical method and electrical method. (4 marks)
- (b) Define servomechanisms and give FOUR (4) examples of the application. (15 marks)
- (c) The function of calibration is to maintain accuracy of the measuring instrument. However, errors can occur during instrument calibration measurement. Define error and explain any TWO (2) types of instrument calibration error. (6 marks)

**QUESTION 4**

- (a) State and define FIVE (5) elements of the basic block diagram in control systems. (10 marks)
- (b) Simplify the block diagram in Figure 1 using reduction method. (15 marks)

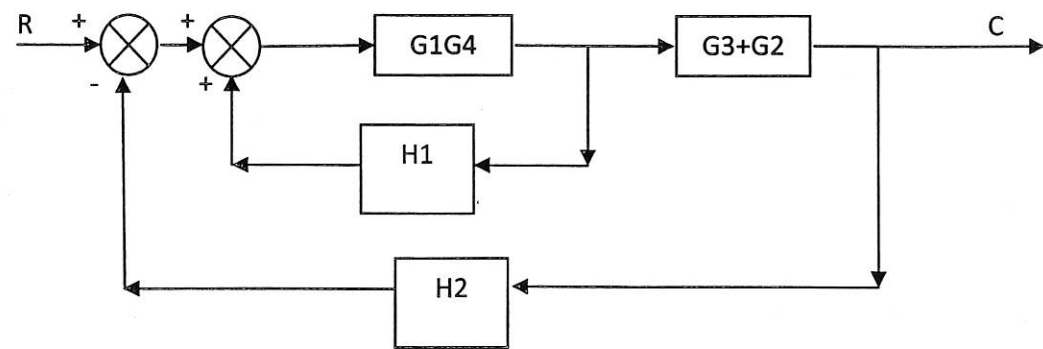


Figure 1

(15 marks)

**QUESTION 5**

- (a) Define process control. (5 marks)
- (b) State and explain TWO (2) types of process control. (10 marks)
- (c) Sketch and show the response of P+I control. State TWO (2) advantages of using this composite control compared to Proportional (P) control. (10 marks)

**QUESTION 6**

- (a) Explain the following terminologies:
  - i. Digital to analog converter (3 marks)
  - ii. Analog to digital converter (3 marks)
  - iii. Analog signal (3 marks)
  - iv. Digital signal (3 marks)
- (b) Sketch and explain Direct Digital Control (DDC) block diagram. (13 marks)