

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN KEJURUTERAAN MEKANIKAL

PEPERIKSAAN AKHIR

SESI JUN 2016

JJ517: INSTRUMENTATION & CONTROL

TARIKH : 24 OKTOBER 2016

MASA : 11.15 AM – 1.15 PM (2 JAM)

Kertas ini mengandungi **TIGA BELAS (13)** halaman bercetak.

Bahagian ini mengandungi enam (6) soalan berstruktur. Jawab empat(4) soalan

Dokumen sokongan yang disertakan: Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTION:

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

ARAHAN:

Bahagian ini mengandungi ENAM (6) soalan . Jawab EMPAT(4) soalan.

QUESTION 1**SOALAN 1**

- CLO1
C2 (a) Explain the importance of instrumentation in industrial.
Terangkan kepentingan instrumentasi di dalam perindustrian
- [5 marks]
[5 markah]
- CLO1
C1 (b) i. Name the **THREE (3)** main components in instrumentation system.
Namakan TIGA (3) komponen utama di dalam sisystem instrumentasi.
- [3 marks]
[3 markah]
- CLO1
C2 ii. Explain the function of every component in **Question 1) b) i.**
Terangkan fungsi setiap komponen pada Soalan 1) b) i.
- [6 marks]
[6 markah]
- CLO1
C2 (c) From your opinion what is the difference between International Standard and Main Reference Standard in calibration proses.
Pada pendapat awak apakah perbezaan di antara Piawai Antarabangsa dan Piawai Rujukan Utama di dalam proses penentukuran.
- [5 marks]
[5 markah]

CLO1
C2

(d) Explain how to use Dead Weight Tester to calibrate the pressure gauge with the aid of a diagram.

Terangkan bagaimana menggunakan Penguji Pemberat Mati untuk menentukur tolok tekanan dengan bantuan gambarajah.

[6 marks]

[6 markah]

QUESTION 2

SOALAN 2

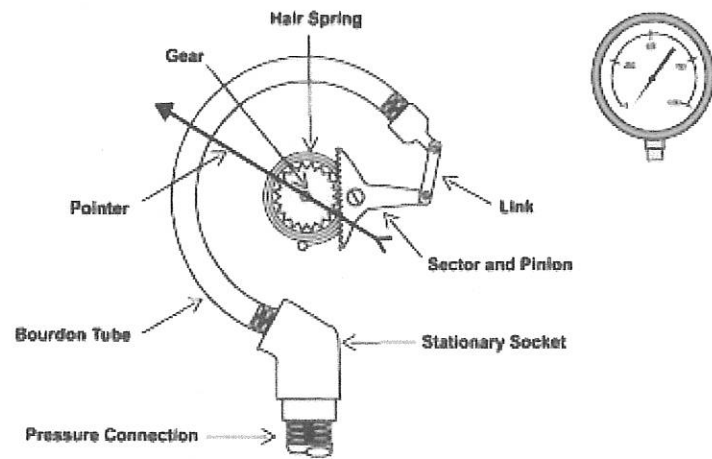


Figure 1.0/Rajah 1.0

CLO1
C3

(a) Explain the working principle for the Bourdon Gauge in Figure 1.0.

Terangkan prinsip kerja untuk Tolok Bourdon dalam Rajah 1.0.

[5 marks]

[5 markah]

CLO1
C2

(b) State the **THREE (3)** methods to avoid gauge from liquid corrosion during pressure measurement.

Nyatakan TIGA (3) kaedah untuk mengelak tolok daripada hakisan cecair semasa bacaan diambil.

[3 marks]

[3 markah]

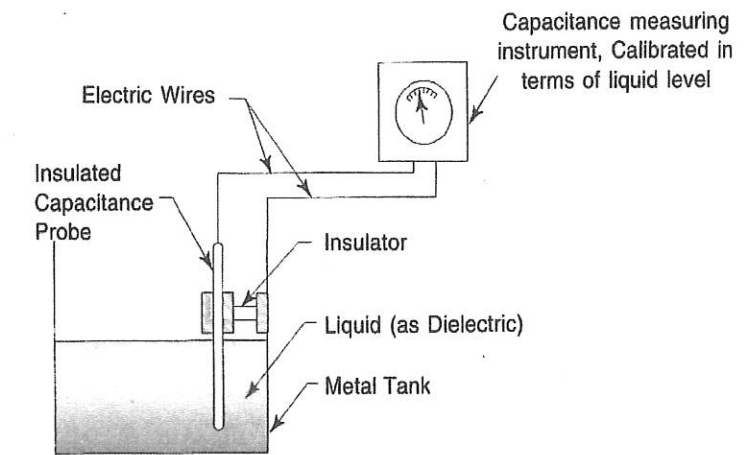


Figure 2.0/Rajah 2.0

CLO1
C3

(c) Explain the working principle and characteristics of the instrument in Figure 2.0.

Terangkan prinsip kerja dan ciri instrument di dalam Rajah 2.0.

[5 marks]

[5 markah]

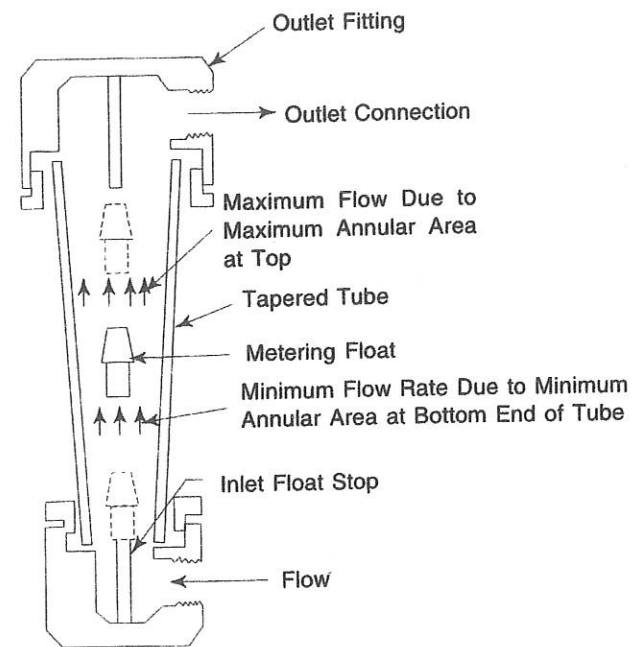


Figure 3.0/Rajah 3.0

- CLO1 C3 (d) Explain the working principle and characteristics of the instrument in **Figure 3.0**.
Terangkan prinsip kerja dan ciri instrument di dalam Rajah 3.0.
- [5 marks]
[5 markah]
- CLO1 C4 (e) Explain the differences between transit-time and doppler shift ultrasonic flowmeter.
Terangkan perbezaan di antara pengukur kadar alir gelombang jenis anjakan masa dan anjakan dopler.
- [3 marks]
[3 markah]
- CLO1 C3 (f) Explain the **FOUR (4)** differences between thermocouple and Resistance Temperature Detector (RTD).
Terangkan EMPAT (4) perbezaan di antara Penganding Suhu dan Resistance Temperature Detector (RTD).
- [4 marks]
[4 markah]

QUESTION 3

SOALAN 3

- CLO2 C2 (a) Explain what is the control system in the industry?
Terangkan apakah sistem kawalan di dalam industri ?
- [4 marks]
[4 markah]
- CLO2 C4 (b) There are three types of control system, from your opinion which one is suitable for precision and fast transfer job? Explain your answer.
Terdapat tiga jenis sistem kawalan, pada pendapat anda yang manakah sesuai untuk kerja yang tepat dan cepat ? Terangkan jawapan anda.
- [4 marks]
[4 markah]
- CLO2 C3 (c) Explain the importance of control system in the manufacturing process.
Terangkan kepentingan sistem kawalan di dalam process pembuatan.
- [4 marks]
[4 markah]
- CLO2 C3 (d) Draw the block diagram for :
Lukiskan gambarajah blok bagi:
- i. Open Loop System
Sistem Gelung Terbuka
- [3 marks]
[3 markah]
- ii. Close Loop System
Sistem Gelung Tertutup
- [3 marks]
[3 markah]

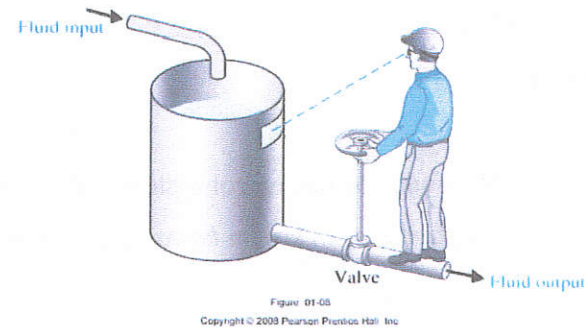


Figure 4.0/ Rajah 4.0

CLO2
C2

- (e) Draw the block diagram for the control system in Figure 4.0
Lukiskan gambarajah blok bagi sistem kawalan terbuka pada Rajah 4.0.

[3 marks]

[3 markah]

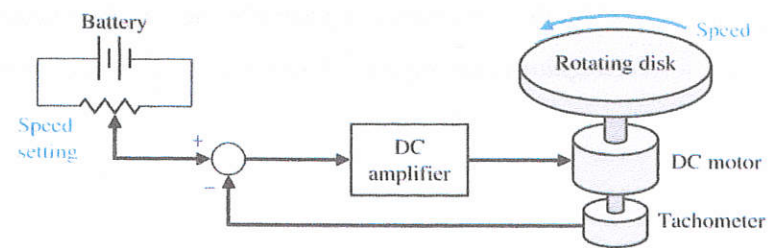


Figure 5.0/ Rajah 5.0

CLO2
C3

- (f) Draw the block diagram for the control system in Figure 5.0.
Lukiskan gambarajah blok bagi sistem kawalan pada Rajah 5.0.

[4 marks]

[4 markah]

QUESTION 4

SOALAN 4

CLO2
C1

- (a) i. State TWO examples of close loop control system.
Nyatakan DUA contoh sistem kawalan gelung tertutup.

[2 marks]

[2 markah]

- ii. State TWO examples of open loop control system.
Nyatakan DUA contoh sistem kawalan gelung terbuka.

[2 marks]

[2 markah]

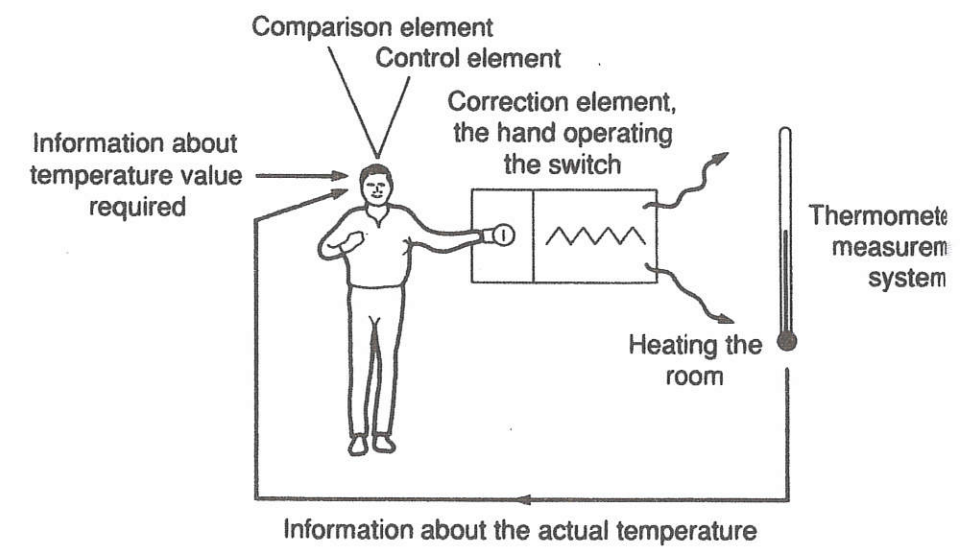


Figure 6.0/ Rajah 6.0

CLO2
C2

- (b) Explain the following component based on Figure 6.0:
Terangkan komponen berikut berdasarkan Rajah 6.0.

- i. Controlled variable
Pembolehubah yang dikawal

- ii. Reference value
Nilai rujukan
- iii. Comparison element
Elemen perbandingan
- iv. Error signal
Isyarat ralat
- v. Control element
Elemen kawalan
- vi. Correction element
Elemen pembedulan
- vii. Process
Proses
- viii. Measuring device
Alat pengukuran

[8 marks]

[8 markah]

CLO2
C3

- (c) Explain **FOUR (4)** differences between open loop and close loop control system.

Terangkan EMPAT (4) perbezaan di antara sistem kawalan gelung terbuka dan gelung tertutup.

[4 marks]

[4 markah]

CLO2
C2

- (d) Explain what is transfer function in control system.

Terangkan apakah rangkap pindah dalam sistem kawalan.

[4 marks]

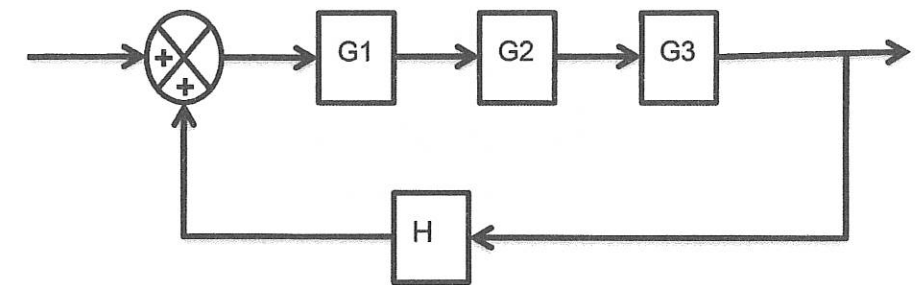
[4 markah]

CLO2
C3

- (e) Solve the transfer function $(\frac{\theta_o}{\theta_i})$ for the following block diagram.

Selesaikan rangkap pindah $(\frac{\theta_o}{\theta_i})$ untuk gambarajah blok berikut.

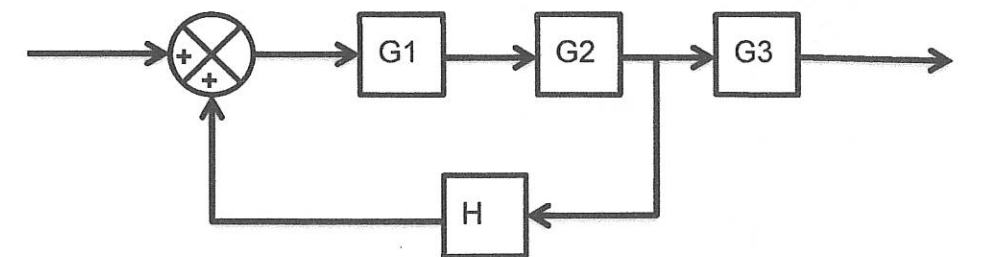
i.



[2 marks]

[2 markah]

ii.



[3 marks]

[3 markah]

QUESTION 5

SOALAN 5

CLO2
C1

- (a) State the equation for :
Nyatakan persamaan untuk:
- Proportional Control System
Sistem Kawalan Perkadaran.
 - Integral Control System.
Sistem Kawalan Pengamiran.
 - Derivative Control System.
Sistem Kawalan Pembezaan

[6 marks]

[6 markah]

CLO2
C2

- (b) Explain the relationship between the control output and error signal for Proportional Control System.
Terangkan hubungan di antara keluaran pengawal dan isyarat ralat untuk Sistem Kawalan Perkadaran.

[2 marks]

[2 markah]

CLO2
C2

- (c) Explain **TWO (2)** characteristics of Integral Control System.
Terangkan DUA (2) ciri-ciri Sistem Kawalan Pengamiran.

[4 marks]

[4 markah]

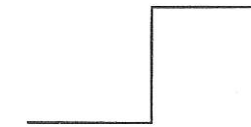


Figure 5.0/ Rajah 5.0

CLO2
C3

- (d) Draw the output signal for the following control system if the input signal is in **Figure 5.0:**
Lukiskan isyarat keluaran untuk sistem kawalan sekiranya isyarat masukan seperti Rajah 5.0.

- Proportional Control System
Sistem Kawalan Perkadaran
- Integral Control System.
Sistem Kawalan Pengamiran
- Derivative Control System.
Sistem Kawalan Pembezaan
- Proportional + Integral Control System
Sistem Kawalan Perkadaran + Pengamiran

[8 marks]

[8 markah]

CLO2
C4

- (e) From your opinion, which control system is the most powerful and can be used to control all types of processes in manufacturing industry.
Pada pendapat anda, sistem kawalan yang manakah yang paling baik dan boleh digunakan untuk mengawal kesemua proses dalam industri pembuatan.

[5 marks]

[5 markah]

QUESTION 6

SOALAN 6

CLO2
C2

- a) Explain the terms below :
Terangkan istilah di bawah :

- i. Analogue input
Input analog
- ii. Digital output
Output digital
- iii. Analogue to digital convertor (ADC)
Penukar analog kepada digital
- iv. Telemetry
Telemetri

[8 marks]

[8 markah]

CLO2
C4

- b) Explain the following concepts with the aid of a diagram:
Terangkan konsep berikut dengan bantuan gambarajah:

- i. Direct Digital Control (DDC)
Kawalan Digital Terus
- ii. Distributed Control System (DCS)
Sistem Kawalan Teragih

[8 marks]

[8 markah]

[9 marks]

[9 markah]

SOALAN TAMAT