INSTRUCTION:
This section consists of **FOUR (4)** structured questions. Answer all questions.

ARAHAN:
*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab semua soalan.*

QUESTION 1
SOALAN 1

CLO1
C1

(a) Define instrumentation and state **TWO (2)** significances of instrumentation in process variable measurement.
*Definisikan peralatan dan nyatakan **DUA (2)** kepentingan peralatan dalam proses pengukuran pembolehubah.*

[6 marks]
[*6 markah*]

CLO1
C2

(b) Discuss **FOUR (4)** types of controllable errors and which type can be classified as static error?
*Senaraikan **EMPAT (4)** jenis ralat bolehkawal dan kenalpasti di antaranya sebagai ralat statik?*

[9 marks]
[9 *markah*]

CLO2
C3

(c) With the aid of a diagram, describe the operational of pressure transducers (bellows) that apply the secondary element (strain gauge) in the measurement.
Dengan bantuan rajah, terangkan prinsip operasi bagi transduser tekanan (belos) yang mengaplikasikan elemen sekunder (tolok terikan) dalam pengukuran.

[10 marks]
[*10 markah*]

QUESTION 2
SOALAN 2

CLO2
C1

(a) List **FOUR (4)** direct level sensing instruments in level measurement.
*Berikan **EMPAT (4)** peralatan bagi pengukuran paras bendalir jenis terus.*

[4 marks]
[4 *markah*]

CLO2
C2

(b) Explain the principle operation and construction of a displacer, with the aid of a diagram.
Terangkan prinsip operasi dan binaan bagi displacer, dengan bantuan gambarajah.

[8 marks]
[8 *markah*]

CLO2
C3

(c) Describe with the aid of a simple sketch and formula, the differential pressure method employing a differential pressure transmitter to measure the level of liquid in the open tank.
Jelaskan dengan bantuan lakaran dan formula tertentu bagi kaedah perbezaan tekanan menggunakan transmitter perbezaan tekanan untuk mengukur paras bendalir bagi tangki terbuka.

[13 marks]
[13 *markah*]

QUESTION 3
SOALAN 3

CLO2
C1

(a) Name **FIVE (5)** types of constriction flow meter.
*Namakan **LIMA (5)** jenis meter aliran jenis halangan.*

[5 marks]
[5 *markah*]

(b) i. Identify the intensity magnetic field (B), diameter of a pipe (d) and average velocity (V) in an Electromagnetic flow meter with the aid of a labelled diagram.

CLO2
C2

Kenalpasti tekanan keamatan medan magnet (B), diameter sesebuah paip (d) dan halaju purata (V) dalam sebuah meter alir Elektromagnet bersama bantuan gambarajah yang dilabel.

[5 marks]
[5 markah]

ii. State **THREE (3)** advantages of using Electromagnetic flow meter.
*Nyatakan **TIGA (3)** kelebihan menggunakan meter alir elektromagnet.*

[3 marks]
[3 markah]

(c) Illustrate the principle operation of Turbine flow meter with detail explanation. Give **TWO (2)** advantages and **TWO (2)** disadvantages of this meter.

CLO2
C3

*Ilustrasikan prinsip operasi bagi meter alir turbin bersama penjelasan yang terperinci. Berikan **DUA(2)** kelebihan dan **DUA(2)** kelemahan bagi meter ini.*

[12 marks]
[12 *markah*]

QUESTION 4
SOALAN 4

(a) Name **FOUR (4)** types of thermometer.

CLO2
C1

*Namakan **EMPAT (4)** jenis termometer.*

[4 marks]
[4 markah]

(b) Using a neat sketch, explain the construction and working procedures of the Resistance Thermometer.

CLO2
C2

Menggunakan lakaran yang kemas, terangkan binaan dan prosedur kerja bagi meter suhu rintangan.

[8 marks]

[8 *markah*]

CLO2
C3

(c) Resistance Temperature Detector (RTD) are used to measure the temperature of the reactor outlet feeders in nuclear power plant. Thermocouples are used to measure temperatures on the turbine. Explain the reasons for the selection of these devices for their respective applications.

Resistance Temperature Detector (RTD) digunakan untuk mengukur suhu bagi suapan keluaran reaktor dalam lojikuasa nuklear. Termogandingan digunakan untuk mengukur suhu bagi turbin. Terangkan sebab-sebab bagi pemilihan peralatan diatas mengikut aplikasi masing-masing.

[13 marks]

[13 *markah*]

SOALAN TAMAT