SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI DISEMBER 2018

DEJ3143: INSTRUMENTATION

TARIKH : 19 APRIL 2019
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **TIGA BELAS (13)** halaman bercetak.
Bahagian A: Objektif (10 soalan)
Bahagian B: Struktur (4 soalan)
Bahagian C: Esei (2 soalan)
Dokumen sokongan yang disertakan : ~~Kertas Graf, Formula dsb~~ / Tiada

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JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A: 10 MARKS
BAHAGIAN A: 10 MARKAH

INSTRUCTION:
This section consists of **TEN (10)** objective questions. Mark your answers in the OMR form provided.

ARAHAN :
*Bahagian ini mengandungi **SEPULUH (10)** soalan objektif. Tandakan jawapan anda di dalam borang OMR yang disediakan.*

CLO1
C1

1. Identify the device that changes one instrument signal value to another instrument signal value.

   Kenal pasti peranti yang menukar satu nilai isyarat alatan ke nilai isyarat alatan yang lain.

   A. Filter /*Penapis*

   B. Sensor/*Pengesan*

   C. Transducer/*Penukar*

   D. Transmitter/*Penghantar*

CLO1
C2

2. Determine a certain type of materials that generate an electrostatic charge or voltage when mechanical force is applied across them.

   Tentukan jenis bahan yang tertentu bagi menghasilkan cas elektrostatik atau voltan apabila daya mekanikal dikenakan.

   A. Piezo-electric

   B. Photo-electric

   C. Thermo-electric

   D. Photo-resistive

CLO1
C2

3. Determine a type of cylinder where it converts the compressed air energy into mechanical energy within one linear direction in a form of force.

Tentukan jenis silinder yang menukarkan tenaga udara termampat ke tenaga mekanikal dalam bentuk daya dan gerakan linear dalam satu arah sahaja.

A. Double-acting cylinder
Silinder dua tindakan

B. Piston cylinders
Silinder omboh

C. Single-acting cylinder
Silinder tindakan tunggal

D. Short-stroke Cylinders
Silinder lejang pendek

CLO2
C3

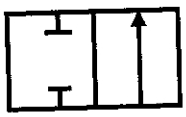
4. "A 5/2 way valve has a pressure port, two outlet port and two exhaust port."

Which of the following figure illustrates the statement above?

"Sebuah injap 5/2 hala mempunyai satu liang tekanan, dua liang keluaran dan dua liang ekzos."

Yang mana satu rajah berikut menggambarkan kenyataan di atas?

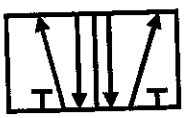
A.



B.

C.

D.



CLO1
C2

5. Determine the function of hydraulic motor.
Tentukan fungsi motor hidraulik.

I. Hydraulic motor converts hydraulic oil under pressure into torque and angular displacement
Motor hidraulik menukar minyak hidraulik bertekanan rendah ke tork dan anjakan sudut

II. Hydraulic motor converts hydraulic oil under pressure into force and linear displacement
Motor hidraulik menukarkan minyak hidraulik bertekanan rendah kepada daya dan anjakan linear

III. Hydraulic motor converts hydraulic energy into mechanical energy
Motor hidraulik menukarkan tenaga hidraulik kepada tenaga mekanikal

IV. Hydraulic motor converts mechanical energy into hydraulic energy
Motor hidraulik menukarkan tenaga mekanikal kepada tenaga hidraulik

A. I and IV

B. I and III

C. II and III

D. II and IV

CLO2
C3

6. In a hydraulic system, a piston with a cross-sectional surface area of 21cm^2 (A_1) pushes the incompressible liquid with a force of 38 newtons (F_1). The far end of the hydraulic pipe connects to a second piston with a cross-sectional surface area of 100cm^2 (A_2). Calculate the force, F_2 on the second piston using a given Pascal's Law;

Dalam sistem hidraulik, omboh dengan luas permukaan keratan rentas 21cm^2 (A_1) menolak cecair tidak mampat dengan daya 38 newtons (F_1). Hujung paip hidraulik dihubungkan dengan omboh kedua dengan luas permukaan keratan rentas 100cm^2 (A_2). Kirakan daya, F_2 pada omboh kedua menggunakan Hukum Pascal yang diberikan;

$$\textit{Pascal's principle} = \frac{F_1}{A_1} = \frac{F_2}{A_2}$$

A. 0.18 x 10^2 N

B. 0.018 x 10^2 N

C. 18.0 x 10^2 N

D. 1.8 x 10^2 N

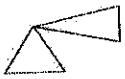
CLO1
C1

7. Identify the symbol for a Globe valve.

Kenalpasti symbol untuk injap Glob.

A. 

B. 

C. 

D. 

CLO1
C2

8. "When a mechanical device that connects one circuit to another, it should be thought of as a switch." The device refers to:

"Apabila satu alat mekanikal yang menghubungkan satu litar kepada litar lain, ia harus dianggap sebagai suis." Peranti tersebut merujuk kepada:

A. bellows
belos

B. relay
geganti

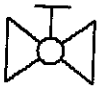
C. flapper and nozzle
pengepak dan muncung

D. limit switches
suis penghad

CLO1
C1

9. Identify the symbol for pneumatic control valve.
Tentukan simbol bagi injap kawalan pneumatik.

A. 

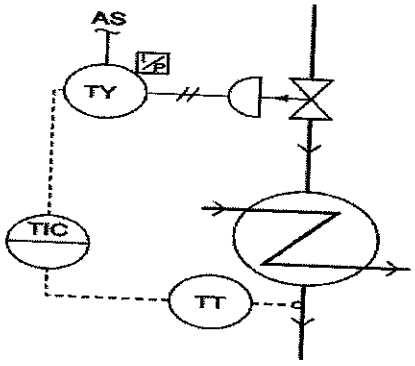
B. 

C. 

D. 

CLO1
C2

10. Identify the controller in the P&ID diagram below.
Kenalpasti pengawal dalam Rajah P&ID di bawah.



A. The controller is mounted in the field near the panel
Pengawal dipasang di lapangan berhampiran panel

B. The controller is mounted in the control room
Pengawal dipasang di dalam bilik kawalan

C. The controller is mounted out of sight
Pengawal dipasang jauh dari pandangan

D. The controller is mounted in front of the control panel
Pengawal dipasang di hadapan panel kawalan

SECTION B: 60 MARKS
BAHAGIAN B: 60 MARKAH

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) Describe the definition of transducer
Terangkan definisi transducer.

[3 marks]
[*3 markah*]

CLO1 C2 (b) Explain how RTD resistance varies when the temperature is increasing or decreasing.
Terangkan bagaimana rintangan RTD berubah apabila suhu meningkat atau menurun.

[5 marks]
[*5 markah*]

CLO2 C3 (c) Explain the operating principle of the thermocouple with the suitable aid of diagram.
Terangkan prinsip kendalian termogandingan dengan bantuan gambarajah yang sesuai.

[7 marks]
[*7 markah*]

QUESTION 2
SOALAN 2

CLO1
C1

(a) Describe pneumatic system.
Terangkan sistem pneumatik.

[3 marks]
[*3 markah*]

CLO1
C2

(b) Identify **THREE (3)** reasons to be considered on the use of pneumatics instead of hydraulics.
*Kenal pasti **TIGA (3)** sebab untuk mempertimbangkan penggunaan pneumatik berbanding hidraulik.*

[5 marks]
[*5 markah*]

CLO2
C3

(c) Draw a pneumatic signal flow and the corresponding control elements.
Lukis aliran isyarat pneumatik dan elemen kawalan yang sepadan.

[7 marks]
[*7 markah*]

QUESTION 3
SOALAN 3

CLO1
C1

(a) Briefly describe hydraulics system.
Terangkan secara ringkas sistem hidraulik..

[3 marks]
[*3 markah*]

CLO1
C2

(b) Identify the factors that must be taken into consideration before hydraulics system is applied.
Kenalpasti faktor-faktor yang perlu dipertimbangkan sebelum sistem hidraulik digunakan.

[5 marks]
[*5 markah*]

CLO2
C3

(c) The combined pumping and driving motor unit is known as hydraulic pump. The hydraulic pump takes hydraulic fluid (mostly some oil) from the storage tank and delivers it to the rest of the hydraulic circuit. The hydraulic pumps can be of two types which are centrifugal pump and reciprocating pump. Explain briefly for each pump.
Pam gabungan dan pemacu motor dikenali sebagai pam hidraulik. Pam hidraulik mengambil cecair hidraulik (kebiasaannya minyak) dari tangki penyimpanan dan menyalurkannya ke seluruh litar hidraulik. Pam hidraulik boleh terdiri daripada dua jenis iaitu pam empar dan pam tahan karat. Terangkan secara ringkas untuk setiap pam.

[7 marks]
[*7 markah*]

QUESTION 4
SOALAN 4

CLO1
C1

(a) Figure B4 (a) shows the Air-to-close valve. Name each part as numbered from 1 to 3.

Rajah B4(a) menunjukkan injap udara ke penutup. Namakan setiap bahagian yang bernombor dari 1 hingga 3.

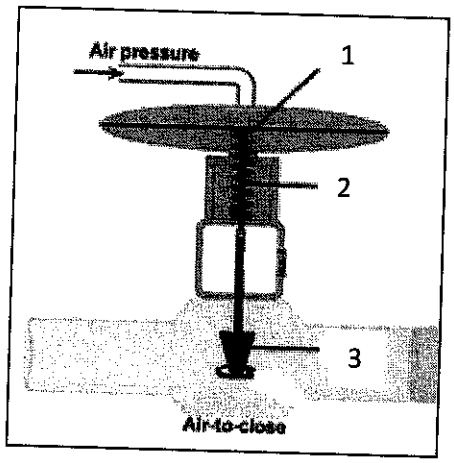


Figure B4(a)/*Rajah B4(a)*

[3 marks]
[*3 markah*]

CLO1
C2

(b) Process diagrams can be divided into two major categories which are process flow diagrams (PFDs) and process/piping and instrument drawings (P&IDs). Differentiate both of the diagrams.

Rajah proses terbahagi kepada dua kategori utama iaitu Rajah proses aliran (PFD) dan instrumentasi dan proses/perpaipan (P&ID). Bezakan kedua-dua rajah tersebut.

[5 marks]
[*5 markah*]

CLO2
C3

(c) Figure B4(c) shows a single loop that controls a heat exchanger. The process can be illustrated by P&ID. Explain the process.

Rajah B4 (c) menunjukkan gelung tunggal yang mengawal penukar haba. Proses ini boleh digambarkan oleh rajah P&ID. Terangkan proses tersebut.

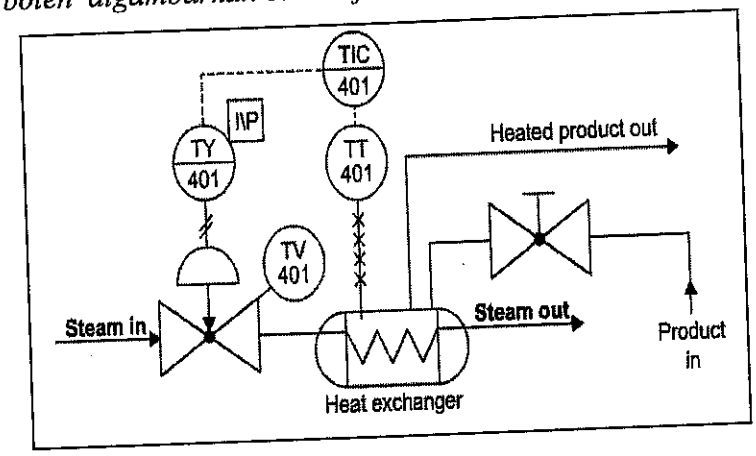


Figure B4(c)/*Rajah B4(c)*

[7 marks]

[7 *markah*]

SECTION C: 30 MARKS
BAHAGIAN C: 30 MARKAH

INSTRUCTION:
This section consists of **TWO (2)** essay questions. Answer **ALL** questions.

ARAHAN:
*Bahagian ini mengandungi **DUA (2)** soalan esei. Jawab **SEMUA** soalan.*

QUESTION 1
SOALAN 1

CLO2
C3

A city-centre car park has a barrier system to prevent people parking illegally. The car park attendant checks all the cars entering and leaving the car park. The barrier is raised and lowered when attendant pushes a button to operate the system. Draw a pneumatic circuit diagram by using 1 unit of double-acting cylinder, 1 unit of 5/2-way valve with pilot control, 2 unit of push button of 3/2 way valve with return spring and 1 unit unidirectional restrictor. Explain the process of the system.

Tempat letak kereta pusat bandar mempunyai sistem penghalang untuk mengelakkan orang ramai meletak kenderaan secara haram. Penjaga parkir kereta memeriksa semua kereta yang memasuki dan meninggalkan tempat letak kereta. Penghalang diangkat dan diturunkan apabila penjaga parker menekan butang untuk mengendalikan sistem. Lukis gambarajah litar pneumatik dengan menggunakan 1 unit double-acting cylinder,1 unit 5/2-way valve with pilot control, 2 unit push button of 3/2 way valve with return spring dan 1 unit unidirectional restrictor. Terangkan proses bagi sistem ini.

[15 marks]
[15 markah]

QUESTION 2
SOALAN 2

CLO2
C3

Figure C2 shows a basic hydraulic systems for typical steering unit. It consists of a reservoir, supply pump, a filter, relief valve and cylinder. Explain the function of each component and the operation principle of the system.

Rajah C2 menunjukkan sistem hidraulik bagi unit stereng biasa yang terdiri daripada tangki, pam, penapis, injap pelega dan silinder. Terangkan fungsi bagi setiap komponen dan prinsip kendalian bagi sistem ini.

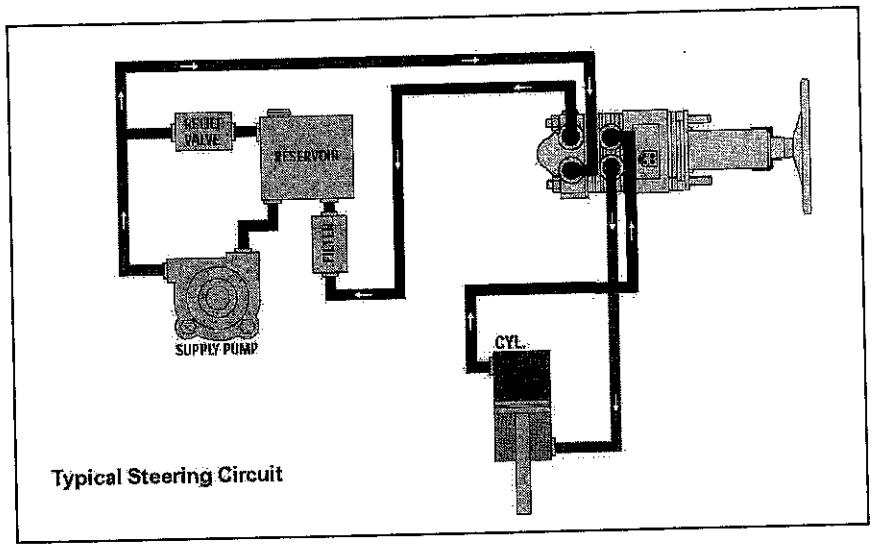


Figure C2/*Rajah C2*

[15 marks]
[*15 markah*]

SOALAN TAMAT