

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENGAJIAN TINGGI**

JABATAN KEJURUTERAAN MEKANIKAL

PEPERIKSAAN AKHIR

SESI I : 2022 / 2023

DJJ10033: WORKSHOP TECHNOLOGY

TARIKH : 28 DISEMBER 2022

MASA : 8.30 AM – 10.30 AM (2 JAM)

Kertas ini mengandungi **TUJUH (7)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTIONS:

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

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan. Jawab **SEMUA** soalan.*

QUESTION 1**SOALAN 1**CLO1
C1

- (a) Name **SIX (6)** hand tools which are used in mechanical engineering workshop.

*Namakan **ENAM (6)** alatan tangan yang digunakan di dalam bengkel kejuruteraan mekanikal.*

[6 marks]

[6 markah]

CLO1
C2

- (b) Micrometer and vernier caliper are two types of measuring tools commonly used in engineering workshops.

Mikrometer dan angkup vernier adalah dua jenis alat pengukuran yang biasa digunakan didalam bengkel kejuruteraan.

- (i) Explain procedure in using a micrometers.

Terangkan prosedur menggunakan mikrometer.

[4 marks]

[4 markah]

- (ii) Fill in the correct reading in **Table 1(b)** based on given vernier caliper and micrometer below.

*Isikan bacaan yang betul ke dalam **Jadual 1(b)** berdasarkan angkup vernier dan mikrometer pada **Rajah 1(b)** di bawah.*

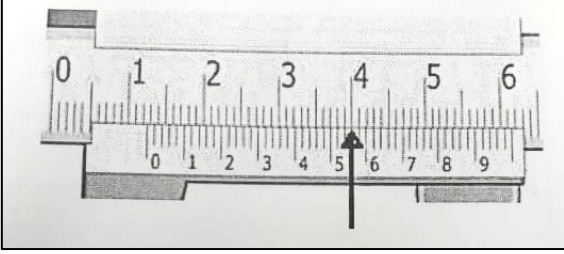
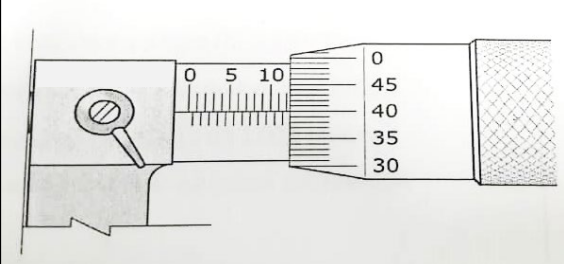
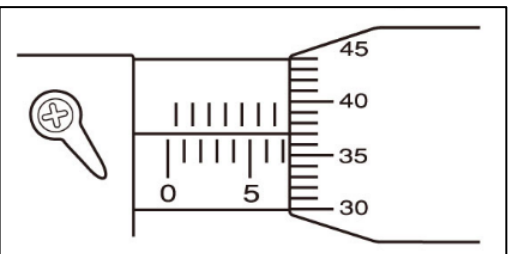
Measurement tool	Value
 <p data-bbox="581 577 803 613">Vernier Caliper 1</p>	<p data-bbox="1010 357 1388 392">Main scale : _____</p> <p data-bbox="1010 430 1388 466">Vernier scale : _____</p> <p data-bbox="1010 504 1388 539">Total : _____</p>
 <p data-bbox="609 945 779 980">Micrometer 1</p>	<p data-bbox="1010 697 1388 732">Sleeve scale : _____</p> <p data-bbox="1010 770 1388 806">Thimble scale : _____</p> <p data-bbox="1010 844 1388 879">Total : _____</p>
 <p data-bbox="609 1297 779 1333">Micrometer 2</p>	<p data-bbox="1010 1054 1388 1089">Sleeve scale : _____</p> <p data-bbox="1010 1127 1388 1163">Thimble scale : _____</p> <p data-bbox="1010 1201 1388 1236">Total : _____</p>

Table 1(b) / Jadual 1(b)

[9 marks]

[9 markah]

CLO1
C3

- (c) Sketch a twist drill bit.
Lakarkan sebatang mata gerudi piuh.

[6 marks]

[6 markah]

QUESTION 2**SOALAN 2**CLO1
C1

- (a) Lathe machine is a machine tool that rotates the workpiece on its axis to perform operations.

Mesin larik adalah alatan mesin yang memutarakan bahan kerja pada paksinya untuk melakukan operasi.

- (i) List **FIVE (5)** types of lathe machine.

Senaraikan LIMA (5) jenis mesin larik.

[5 marks]

[5 markah]

- (ii) List **FIVE (5)** operations that can be performed on a lathe machine.

Senaraikan LIMA (5) operasi yang boleh dilakukan pada mesin larik.

[5 marks]

[5 markah]

CLO1
C2

- (b) (i) Match the milling machine process based on **Figure 2(b)**.

Padankan proses mesin kisar berdasarkan Rajah 2(b).

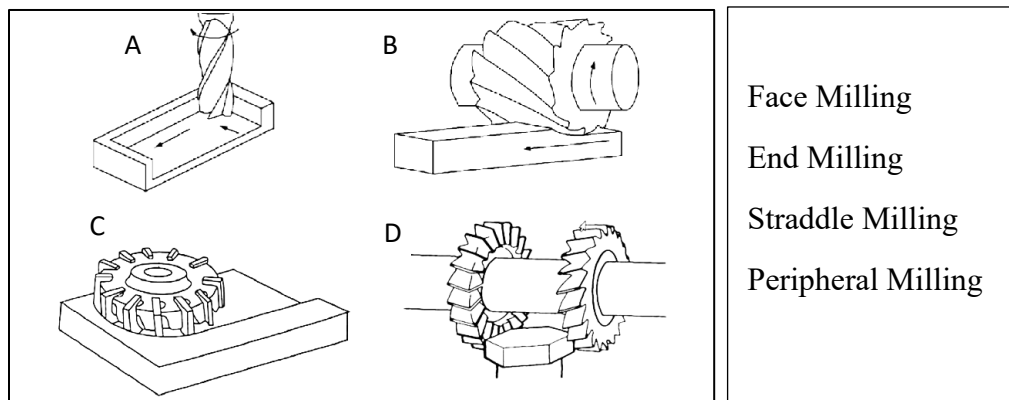


Figure 2(b) / Rajah 2(b)

[4 marks]

[4 markah]

- (ii) Explain **FIVE (5)** safety procedures during the milling machine operation.
Terangkan LIMA (5) langkah-langkah keselamatan semasa operasi mesin peraut .

[5 marks]

[5 markah]

CLO1
C3

- (c) Calculate the feed rate in millimeter/minute for a twelve tooth (12 tooth) helical carbide, a milling cutter with diameter of 50 mm for machining a cast iron work piece (CS 33). Use the value of chip per tooth CPT of 0.06.

Kirakan kadar suapan dalam millimeter/minit bagi pemotongan mata alat peraut karbida heliks dua belas gigi (12 gigi) yang berdiameter 50 mm untuk memotong bahan kerja besi tuang (CS 33). Ambil nilai CPT=0.06.

[6 marks]

[6 markah]

QUESTION 3**SOALAN 3**CLO2
C1

- (a) State **FIVE (5)** types of gears.
Nyatakan LIMA (5) jenis gear.

[5 marks]

[5 markah]

CLO2
C2

- (b) Explain **FOUR (4)** advantages of CNC machining over conventional machining.

Terangkan EMPAT (4) kelebihan pemesinan CNC berbanding pemesinan konvensional.

[8 marks]

[8 markah]

CLO2
C3

- (c) Based on **Figure 3c**, write a CNC coordinate using the following system;
Berdasarkan Rajah 3c, tulis koordinat CNC menggunakan sistem berikut;

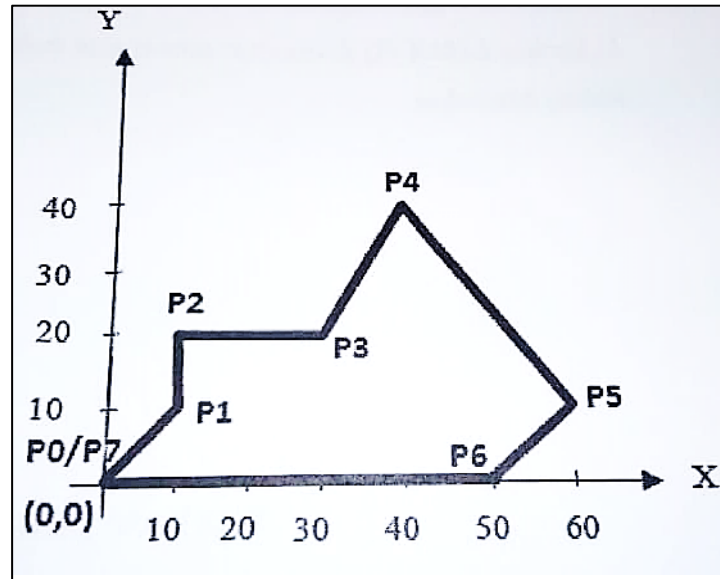


Figure 3c / Rajah 3c

- (i) Absolute coordinate system.

Sistem koordinat mutlak

[6 marks]

[6 markah]

- (ii) Incremental coordinate system.

Sistem koordinat tokokan.

[6 marks]

[6 markah]

QUESTION 4**SOALAN 4**CLO2
C1

- (a) (i) Give the meaning of welding.

Berikan maksud kimpalan.

[1 mark]

[1 markah]

- (ii) State
- FIVE (5)**
- types of basic welding joints.

*Nyatakan **LIMA (5)** jenis sambungan asas kimpalan.*

[5 marks]

[5 markah]

CLO2
C2

- (b) Metal Inert Gas (MIG) Welding is also known as Gas Metal Arc Welding(GMAW).

Kimpalan Logam Gas Lengai (MIG) juga dikenali sebagai Kimpalan Arka Logam Gas (GMAW).

- (i) Explain the advantage of GMAW over SMAW.

Terangkan kelebihan GMAW berbanding SMAW.

[3 marks]

[3 markah]

- (ii) Explain the
- THREE (3)**
- effects of shielding gas in welding.

*Terangkan **TIGA (3)** kesan gas pelindung dalam kimpalan.*

[6 marks]

[6 markah]

CLO2
C3

- (c) Sketch
- FIVE (5)**
- common defects in welding.

*Lakarkan **LIMA (5)** kecacatan umum dalam kimpalan.*

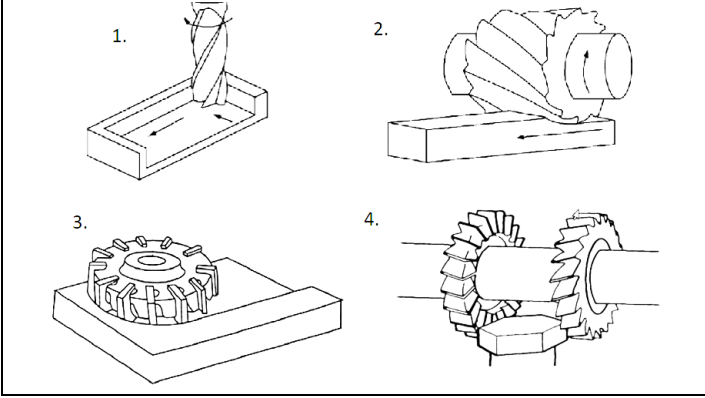
[10 marks]

[10 markah]

SOALAN TAMAT

		<u>MARKS/NOTES</u>
QUESTION 1(a)		Total 6 marks
a) Name SIX (6) hand tools which are used in mechanical engineering workshop.		
<u>Answer</u>		1
i. Tap		1
ii. Dies		1
iii. Files		1
iv. Hammer		1
v. Chisel		1
vi. Hack Saw		
QUESTION 1(b)		Total 13 marks
(i) Explain procedure in using a micrometers.		
<u>Answer</u>		
i. Recognize micrometer body parts		0.5
ii. Hold micrometer properly		0.5
iii. Rotate the thimble		1
iv. Take the reading.		1
v. Add the number together		1
QUESTION 1(b)		
(ii) Fill in the correct reading in Table 1(b) based on given vernier caliper and micrometer below.		
<u>ANSWER</u>		
Vernier caliper 1		1
	Main scale=12 mm	1
	Vernier scale=0.56 mm	1
	Total = 12.56 mm	
Micrometer 1		1
	Sleeve = 12 mm	1
	Thimble = 0.40 mm	1
	Total = 12.40 mm	
Micrometer 2		1
	Sleeve = 7 mm	1
	Thimble = 0.37 mm	1
	Total = 7.37 mm	

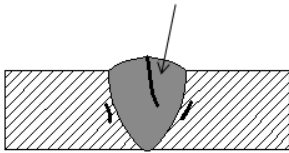
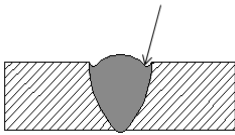
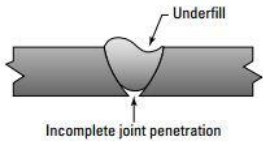
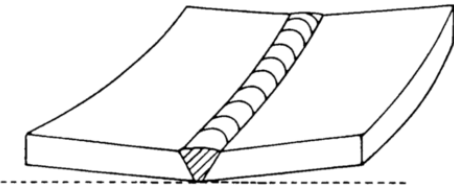
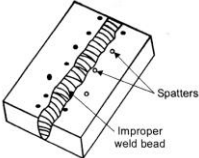
		<u>MARKS/NOTES</u>
<p>QUESTION 1(c) Sketch a twist drill bit.</p>		Total 6 marks
<p><u>Answer</u></p>		2 marks for sketching
		1 marks for each main parts (Choose any 4 answer)
<p>QUESTION 2(a) Lathe machine is a machine tool that rotates the workpiece on its axis to perform operations.</p> <p>(i) List FIVE (5) types of lathe machine.</p>		Total 10 marks
<p><u>Answer</u></p> <ol style="list-style-type: none"> 1. Speed Lathe Machine. 2. Engine Lathe Machine. 3. Bench Lathe Machine. 4. Toolroom Lathe Machine. 5. Capstan and Turret Lathe Machine. 6. Special purpose lathe machines. 7. Automatic Lathe Machine. 		1 1 1 1 1 1
<p>QUESTION 2(a) (ii) List FIVE (5) operations that can be performed on a lathe machine.</p>		(Choose any 5 answer)
<p><u>Answer</u></p> <ol style="list-style-type: none"> 1. Facing 2. Turning 3. Drilling 4. Parting 5. Drilling 6. Boring 7. Threading 8. Chamfering 9. Contouring 		1 1 1 1 1 1 1 1 1
		(Choose any 5 answer)

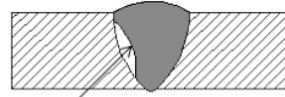
	<u>MARKS/NOTES</u>
<p>QUESTION 2(b)</p>	<p>Total 9 marks</p>
<p>(i) Match the Milling machine process based on Figure 2(b).</p>	
 <p>Figure 2(b) illustrates four types of milling processes:</p> <ul style="list-style-type: none"> 1. End milling: A cylindrical end mill is shown cutting a rectangular slot into a block of material. 2. Peripheral Milling: A cylindrical cutter with multiple teeth is shown cutting a groove into the side of a rectangular block. 3. Face milling: A large-diameter cutter with many teeth is shown cutting the top surface of a rectangular block. 4. Straddle milling: Two cylindrical cutters are shown cutting the top surface of a rectangular block from opposite sides. 	
<p>Answer</p>	
<p>A. End milling</p> <p>B. Peripheral Milling</p> <p>C. Face milling</p> <p>D. Straddle milling</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>
<p>(ii) Explain FIVE (5) safety procedures during the milling machine operation.</p>	
<p>Answer</p>	
<ul style="list-style-type: none"> • Work must be clamped securely in a vise and vise clamped tightly to the table, or, work must be clamped securely to the table. • Do not take climb milling cuts on the shop's mills unless instructed to do so. • Make sure cutter is rotating in the proper direction before cutting material. • Before running machine the spindle should be rotated by hand to make sure it is clear for cutting. • Make sure the power is off before changing cutters. • Always use the proper cutting fluid for the material being cut. • Never run the machine faster than the correct cutting speed. • Make sure that the machine is fully stopped before taking any measurements. • Always use cutters which are sharp and in good condition. • Don't place anything on the milling machine table such as wrenches, hammers, or tools. • Always stay at the machine while it is running. • Don't take too heavy a cut or use too rapid a feed. • Remove the collet tightening wrench immediately after using it. 	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>(Choose any 5 answer)</p>

		<u>MARKS/NOTES</u>																											
QUESTION 3(b)																													
Explain FOUR (4) the advantages of CNC machining over conventional machining.																													
<u>Answer</u>																													
1) The accuracy of the CNC machine ensures consistent product quality . The process is more precise than manual machining and can be repeated in exactly the same manner over and over again.		1 1																											
2) Increased production speed and increased efficiency . Computers are used to control the machines, the process is automated therefore increasing speed and quality of manufacturing. Considering machines do not tire or need breaks it makes it more efficient than manual machining.		1 1																											
3) One of the main advantages for the operators of CNC machines is safety . Using CNC machines are much safer than manually operated machines as they work behind a guard or even a closed, transparent safety door.		1 1																											
4) CNC Machining is more cost effective . Traditional machining requires one operator per machine. This type of machining requires fewer machine operators since one skilled operator can run several machines at one time. Since the CNC is so accurate it reduces errors from the manufacturing process and eliminates unnecessary waste.		1 1																											
QUESTION 3(c)																													
Based on Figure 3c , write a CNC coordinate using the following system.		Total 12 marks																											
<u>Answer</u>																													
(i) Absolute coordinate system.																													
	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Point</th> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr> <td>P0</td> <td>0</td> <td>0</td> </tr> <tr> <td>P1</td> <td>10</td> <td>10</td> </tr> <tr> <td>P2</td> <td>10</td> <td>20</td> </tr> <tr> <td>P3</td> <td>30</td> <td>20</td> </tr> <tr> <td>P4</td> <td>40</td> <td>40</td> </tr> <tr> <td>P5</td> <td>60</td> <td>10</td> </tr> <tr> <td>P6</td> <td>50</td> <td>0</td> </tr> <tr> <td>P7</td> <td>0</td> <td>0</td> </tr> </tbody> </table>	Point	x	y	P0	0	0	P1	10	10	P2	10	20	P3	30	20	P4	40	40	P5	60	10	P6	50	0	P7	0	0	1 1 1 1 1 1 1
Point	x	y																											
P0	0	0																											
P1	10	10																											
P2	10	20																											
P3	30	20																											
P4	40	40																											
P5	60	10																											
P6	50	0																											
P7	0	0																											

			<u>MARKS/NOTES</u>
(ii) Incremental coordinate system.			
Point	x	y	
P0	0	0	1
P1	10	10	1
P2	0	10	1
P3	20	0	1
P4	10	20	1
P5	20	-30	1
P6	-10	-10	1
P7	-50	0	
QUESTION 4(a)			Total 6 mark
(i) Give the meaning of welding.			
<u>Answer</u>			
Welding is a fabrication process whereby two or more parts are fused together by means of heat, pressure or both forming a join as the parts cool.			1
(ii) State FIVE (5) types of basic welding joint			
<u>Answer</u>			
1) Butt joint welding.			1
2) Tee joint welding.			1
3) Corner joint welding.			1
4) Lap joint welding.			1
5) Edge joint welding.			1
QUESTION 4(b)			Total 9 marks
(i) Explain the advantage of GMAW over SMAW.			
<u>Answer</u>			1
Clean: MIG welding is a clean process with little spatter, allowing for smooth, high quality, slag-free joints requiring minimal clean-up. Efficient: Because it is a spooled wire welding process, there is no need to interrupt your welding work to replace the stick rod electrode.			2 (1 mark advantage) (2 marks for explanation)

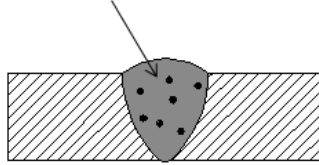
	<u>MARKS/NOTES</u>
<p>(ii) Explain the THREE(3) effects of shielding gas in welding.</p>	
<p><u>Answer</u></p>	
<p>1. Filler Metal Deposition Rate and Efficiency Shielding gas blends with high argon content generally result in high productivity. Placing the workpiece in the flat or horizontal welding position allows you to use spray transfer with these blends. Select shielding gas carefully: Wire feed rates and current levels are high.</p>	2
<p>2. Spatter Control and Postweld Cleaning Argon's low ionization potential results in improved arc stability which, in turn, helps eliminate spatter when you use conventional power supplies. Some recently developed power sources are designed to improve spatter with pure CO₂ shielding gas. It's possible to reduce spatter even more and increase the operating window of these units by using argon-based shielding gases. You can increase the operating current and voltage by 10 percent or more while still maintaining spatter control.</p>	2
<p>3. Bead Profile and Overwelding A CO₂ shielded weld bead tends to have a convex shape, which contributes to overwelding; this increases welding cost. Argon-based blends offer good bead shape control, which can reduce overwelding.</p>	2
<p>4. Bead Penetration, Potential for Burn-through When welding thin material—16- to 22-gauge—a gas blend's welding characteristics become important. One characteristic of pure CO₂, for example, is that it results in increased weld pool energy when compared to an argon/ CO₂ blend. By controlling the blend's CO₂ content, you can control burn-through and increase welding productivity.</p>	(Choose any 3 answer)
<p>5. Out-of-position Weldability Shielding gases with greater reactivity, which use more CO₂ or O₂, will increase weld pool fluidity. For out-of-position work, this may force you to use slower wire feed rates, which will decrease productivity.</p>	
<p>6. Welding Fume Generation Rates Many factors influence welding fume generation, including filler metal, base metal composition, operating parameters, and shielding gas.</p>	
<p>7. Weld Metal Mechanical Properties Since high-argon blends typically are less reactive than other blends, more alloying elements in the filler wire are transferred to the weld pool. This typically increases the weld strength. In all cases, consider your shielding gas when choosing a wire consumable so you know that the resulting weld meets the needs of your application.</p>	

	<u>MARKS/NOTES</u>
<p>QUESTION 4(c)</p>	<p>Total 10 marks</p>
<p>Sketch FIVE (5) common defects in welding.</p>	
<p><u>Answer</u></p>	
<p style="text-align: center;">Cracks</p> 	2
<p style="text-align: center;">Undercut</p> 	2
<p style="text-align: center;">Underfill</p> 	2
<p style="text-align: center;">Distortion</p> 	2
<p style="text-align: center;">Figure 6-50. Distortion in a butt weld.</p>	
<p style="text-align: center;">Slag inclusion</p> 	2



Incomplete Fusion

Porosity



“If the working method is different from the solution given, make an appropriate adjustment to the marking scheme with approval from Program Leader”

(Choose any 5)

(2 marks x 5 =
10 marks)

