

SULIT



**UTHM**  
Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**PEPERIKSAAN AKHIR  
(DALAM TALIAN)  
SEMESTER II  
SESI 2020/2021**

NAMA KURSUS : PENYELENGGARAAN DAN  
PENENTUKURAN PAPAN SUIS  
KOD KURSUS : BBJ10505  
KOD PROGRAM : BBJ  
TARIKH PEPERIKSAAN : JULAI 2021  
JANGKA MASA : 2 JAM  
ARAHAN : JAWAB SEMUA SOALAN

KERTAS SOALAN INI MENGANDUNGI LAPAN (8) MUKA SURAT

**TERBUK SULIT**

S1. (a) *RAJAH S1 (a)* di lampiran A menunjukkan kabel berpenebat XLPE. Labelkan kabel tersebut.

(5 markah)

(b) Sebagai seorang pengurus projek, anda dikehendaki mengira saiz kabel masukan untuk papan suis voltan rendah bagi projek di bawah seliaan anda. *RAJAH S2 (a)* di lampiran menunjukkan susunan *cable tray*. Perincian data adalah seperti Jadual S1 (b) di bawah.

Nota: Rujuk jadual-jadual di Lampiran C.

Jadual S1 (b): Data Kabel

No.	Data	Perincian
1.	<i>Total Connected Load Switchboard</i>	50 A
2.	<i>Voltage</i>	400 V
3.	<i>Length</i>	100 meter
4.	<i>In air perforated cable trays Temperature</i>	40 °C
5.	<i>Cable recommendation type</i>	EPR, copper

- (i) Kirakan kadar arus.  
(ii) Cadangkan saiz kabel.

(8 markah)

(c) Proses *cable sizing* mempunyai beberapa kriteria-kriteria yang perlu diambilkira oleh teknologis. Huraikan kriteria-kriteria tersebut.

(12 markah)

S2. (a) Senaraikan lima (5) jenis *Circuit Breaker*.

(5 markah)

(b) *Mold Case Circuit Breaker (MCCB)* memerlukan penyelenggaraan yang berkala. Sediakan langkah-langkah penyelenggaraan untuk *Mold Case Circuit Breaker*.

(10 markah)

(c) Bandingkan *Miniture Circuit Breaker (MCB)* dan *Mold Case Circuit Breaker (MCCB)*.

(10 markah)

TERBUKA

- S3. (a) Senaraikan lima (5) bahagian *Air Circuit Breaker*.  
(5 markah)
- (b) *Air Circuit Breaker* memerlukan penyelenggaraan berkala bagi mengelakkan kerosakan dan mengekalkan integriti. Sebagai teknologis, rancang model penyelenggaraan yang sesuai.  
(9 markah)
- (c) *Vacuum Circuit Breaker* perlu diperiksa dan diuji mengikut masa tertentu. Antara ujian tersebut adalah *Insulation Resistance Test* dan *Vacuum Test*. Bandingkan ujian-ujian tersebut dan nyatakan tujuan ujian tersebut dilakukan.  
(11 markah)
- S4. (a) Beri definisi *Online Maintenance* dan *Offline Maintenance*. Senaraikan dua (2) contoh *Online Maintenance* dan *Offline Maintenance* bagi busbar.  
(6 markah)
- (b) Sebagai teknologis, kamu diberi tugas daripada pengurus untuk merekabentuk *busbar* bagi projek Papan Suis Utama tiga fasa. Pengurus kamu memberi informasi penting seperti di bawah:
- Lebar, W: 40mm  
Beban Maksima,  $I_{max}$ : 1300A  
Busbar: Copper
- (i) Kirakan Arus Kadar,  $I_{rated}$ . *Safety Factor* (SF). SF = 1.2.  
(ii) Anggarkan saiz ketebalan busbar menggunakan *Busbar Sizing Table*. (rujuk Lampiran C)  
(iii) Anggap *Temperature Rise*,  $T_r$  semasa *short circuit*,  $I_{sc}$  = 50kA untuk Isaat. Selesaikan saiz busbar tersebut.  
(iv) Lukiskan busbar tersebut.  
(9 markah)
- (c) Berikan justifikasi berkenaan penyelenggaraan busbar secara *online* yang mana lebih sesuai bagi sesebuah papan suis utama.  
(10 markah)

-SOALAN TAMAT-

TERBUKA

**Q1.** (a) *FIGURE Q1 (a)* show XLPE insulation cable. Give label for the cable. (5 marks)

(b) As project manager, you need calculate incoming cable size for low voltage main switchboard under your supervision project. *FIGURE Q2 (a)* show cable tray arrangement. The detail data as per Table Q1 (b) below.

Note: Refer to tables at Appendix C.

Table Q1 (b): Cable Data

No.	Data	Detail
1.	Total Connected Load Switchboard	50A
2.	Voltage	400V
3.	Length	100meter
4.	In air perforated cable trays Temperature	40°C
5.	Cable recommendation type	EPR,copper

(i) Calculate the rated current.  
 (ii) Propose the cable size. (8 marks)

(c) Cable sizing process have some criterias which need to consider. Explain all the criterias. (12 marks)

**Q2.** (a) List five (5) type of Circuit Breaker. (5 marks)

(b) Mold Case Circuit Breaker (MCCB) need periodic maintenance. Propose maintenance methods for Mold Case Circuit Breaker. (10 marks)

(c) Compare between Miniature Circuit Breaker (MCB) and Mold Case Circuit Breaker (MCCB). (10 marks)

**TERBUKA**

- Q3. (a) List five (5) parts of Air Circuit Breaker. (5 marks)
- (b) Air Circuit Breaker need periodic maintenance to prevent breakdown and maintain the integrity. As technologist, plan a suitable maintenance model. (9 marks)
- (c) Vacuum Circuit Breaker need to inspect and test at certain period. Some of testing are Insulation Resistance Test and Vacuum Test. Compare both testing and outline the purposes of both testing. (11 marks)
- Q4. (a) Give definition of Online Maintenance and Offline Maintenance. List two (2) of Online Maintenance and Offline Maintenance for busbar. (6 marks)
- (b) As technologist, you gave task from manager to design busbar for three phase main switchboard. Your manager gave important information as per below:  
Width,  $W$ : 40mm  
Maximum Load,  $I_{\max}$ : 1300A  
Busbar: Copper
- (i) Calculate Rated Current,  $I_{\text{rated}}$ . Safety Factor (SF).  $SF = 1.2$ .  
(ii) Estimate width size of busbar using *Busbar Sizing Table*. (refer to Appendix C)  
(iii) Assume *Temperature Rise*,  $T_r$  during *short circuit*,  $I_{\text{sc}} = 50\text{kA}$  for 1sec. Solve the size of busbar.  
(iv) Draw this busbar. (9 marks)
- (c) Give justification about Online Maintenance of busbar which is more suitable for Main Switchboard. (10 marks)

**-END OF QUESTIONS-**

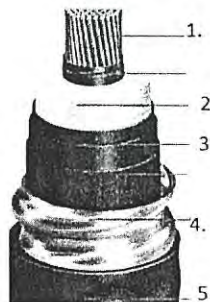
**TERBUKA**

**PEPERIKSAAN AKHIR**

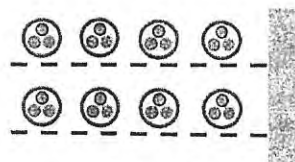
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Lampiran A (*Appendix A*)



RAJAH 1(a)  
FIGURE 1(a)



RAJAH 2(a)  
FIGURE 2(a)

**TERBUKA**

## PEPERIKSAAN AKHIR

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## Lampiran C (Appendix C)

Jadual 4  
 (Table 4)

Size (mm)		Area(mm <sup>2</sup> )	Weight(kg)	Current carrying capacity in amp (Cu) at 35 deg. C			
Width	Thickness			AC(numbers of Bus)			
				I	II	III	IV
12	2	24		110	200		
15	2	30		140	200		
15	3	45		170	300		
20	2	40		185	315		
20	3	60		220	380		
20	5	100		295	500		
25	3	75		270	460		
25	5	125		350	600		
30	3	90		315	540		
30	5	150		400	700		
40	3	120		420	710		
40	5	200		520	900		
40	10	400		760	1350	1850	2500
50	5	250		630	1100	1650	2100
50	10	500		920	1600	2250	3000
60	5	300		760	1250	1760	2400
60	1	60		1060	1900	2600	3500
80	5	400		970	1700	2300	3000
80	10	800		1380	2300	3100	4200
100	5	500		1200	2050	2850	3500
100	10	1000		1700	2800	3650	5000
120	10	1200		2000	3100	4100	5700
160	10	1600		2500	3900	5300	7300
200	10	2000		3000	4750	6350	8800

**TERBUKA**