UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET		
COURSE CODE	:	BET 2022
COURSE	:	UTILIZATION OF ELECTRICAL ENERGY
SEMESTER / SESSION	:	02 – 2023/2024 Flexible
DURATION	:	2 HOURS

Instructions:

1. This booklet contains **4** questions. Answer **ALL**.
2. All answers should be written in the answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hand and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 6 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

a) The **Figure 1** below show the bill of TNB tariff rates for En Muhammad Uwais house. Calculate the real amount of bill for this Domestic Tariff A.

BIL ELEKTRIK ANDA

TENAGA NASIONAL

No. Akaun : 220781xxxxx
No. Kontrak : 4xx28
Deposit : RM594.34
No. Invois : 11875xxxxx

MUHAMMAD UWAIS BIN JAMALUDDIN

LOT PT XXXX, JLN TATI TAMAN TELOK KALONG INDAH
1 KG PANCHOR
24007 TK KALONG KEMAMAN
TERENGGANU

TERIMA KASIH
Kerana
Membayar Dalam
Tempoh 30 Hari

TNB Careline
1-300-88-5454

Jumlah Perlu Dibayar : RM XXXXX | **Tarikh Bil : 20.05.2023** | **Bil : OPC**

		Amaun	Bayar Sebelum
Tunggakan	RM	0.00	Terima Kasih
Caj Semasa	RM	XXXX	
Penggenapan	RM	0.02	
Jumlah Bil	RM	XXXXX	19.06.2023
Bil Terdahulu (19.04.2023)	RM	XXXXX	Bayaran Akhir (19.05.2023) RM XXXXX

Jenis Bacaan : Bacaan Sebenar
Tempoh Bil : 20.04.2023 - 20.05.2023 (31 Hari) | Faktor Prorata 1.00000
Tarif : A:Kediaman

Blok Tarif (kWh)	Kegunaan (kWh)	Kadar(RM)	Amaun(RM)
200	200.00 (200 X 1.00000)	0.2180	XXXX
100	100.00 (100 X 1.00000)	0.3340	XXXX
300	300.00 (300 X 1.00000)	0.5160	XXXX
300	127.00	0.5460	XXXX
Jumlah	727.00		XXXXX

Keterangan		Tidak Kena ST	Kena ST	Jumlah
Kegunaan kWh	kWh	600.00	127.00	727.00
Kegunaan RM	RM	XXXX	XXXX	XXXX
ICPT (-RM0.02/kWh)	RM	-12.00	-2.54	-14.54
Kegunaan Bulan Semasa	RM	XXXX	XXXX	XXXXX
Service Tax (6%)	RM			XXX
KWTBB (1.6%)	RM			XXX
Caj Semasa	RM			XXXXX

No. Meter	Faktor Meter	Bacaan Meter Dahulu	Bacaan Meter Semasa	Kegunaan	Unit
M 214212XXX	1.00000	34,774.00	35,501.00	727.00	kWh

Untuk maklumat bil dan bayaran terdahulu, sila layari http://www.mytnb.com.my atau hubungi Careline TNB 1 300 88 5454
Untuk gangguan bekalan atau kerosakan lampu jalan TNB sila hubungi melalui telefon/SMS: 15454

Surcaj 1% dikenakan bagi pembayaran selepas 30 hari dari tarikh bil selaras dengan Peraturan-Peraturan Bekalan Pemegang Lesen 1990

Bayaran melalui cek sah setelah penjelasan cek oleh bank

Jumlah bil sebenar tanpa subsidi adalah RM506.26. Subsidi yang ditanggung oleh Kerajaan adalah RM210.83.

Figure 1

(10 marks)

QUESTION 2

a) A 415/240 panel board serves the following loads. Calculate the total Connected Load (CL) and the Demand Load (DL) in **Table 1** below. Refer the Industrial Electrical System design panel board and switchboards timetable in **Appendix 1**.

Table 1

No.	Load	Rating
1.	Water Heating	4.8 kW
2.	Spare capacity	10.0 kVA with PF = 0.87
3.	Air Conditioning	12.0 kVA with PF = 0.80
4.	Lighting	14.0 kVA with PF = 0.90
5.	Receptacles	16.0 kVA with PF = 0.93
6.	Resistance Heat	12.0 kW
7.	Motors Gate	8.0 kVA with PF 0.85

(10 marks)

QUESTION 3

a) List **four (4)** sources of short circuit current. (4 marks)

b) Determine the percentage voltage drop along a 415V, three phase feeder, 80 feet in length, consisting of one 400 THW (Thermoplastic Heat and Water Resistant Insulated Wire) copper conductor per phase. The current is 280A at 0.90 PF lagging. Assume steel conduit. from the table of 600V cables; resistance = 0.035Ω/1000ft and reactance = 0.049Ω/1000ft (6 marks)

QUESTION 4

a) Classify between bonding and grounding. (4 marks)

b) Write down the **three (3)** reasons for earthing. (3 marks)

c) Describe the earth continuity conductor impedance as an indicator of improper earthing. (3 marks)

.....End of question.....

APPENDIX 1

Industrial Electrical System Design Panelboards and Switchboards

No.	Connected Load	Demand Factor
1.	Lighting	1.25
2.	Receptacles 1st 10 kVA@100% Remainder@50%	1.00 0.50
3.	Resistance Heat	1.00 or 0.00
4.	Heat Motor	1.00 or 0.00
5.	Air Conditioning Motors	1.00 or 0.00
6.	Motors	1.00
7.	Other Loads	1.00 or 1.25*
8.	Water Heating	1.00
9.	Kitchen	0.65 to 1.00
10.	Spare Capacity	1.00
11.	Largest Motor	0.25

APPENDIX 2

FORMULA SHEET

$$|V_{drop}| \approx |I_b| \times [(R_L \times \cos\theta) - (X_L \times \sin\theta)]$$

R_L = circuit resistance in Ohms

X_L = circuit reactance in Ohms

I_b = design current/ line current

θ = phase angle of line current

if V_A = system voltage

$$\%V_{drop} = \frac{|V_{drop}|}{|V_A|} \times 100\%$$

Motor Starting Voltage Drop (Constant Impedance Method)

kVA = (kVA/Hp) x (Hp)

$$I_{LR} = \frac{kVA}{\sqrt{3} \times 415V}$$

P = (kVA)(%pf)

Q = (kVA)(sin(cos^{-1}%pf))

$$R = \frac{1}{3} \times \left(\frac{PkW}{I_{LR}^{\ 2}} \right)$$

$$X = \frac{1}{3} \times \left(\frac{QkVAr}{I_{LR}^{\ 2}} \right)$$

$$V_M = 240\angle 0° \left(\frac{R + jX}{R + jX + Z} \right)$$

$$\%V_{drop} = \frac{240V - V_M}{240V} \times 100\%$$

- Constant Current Method; $I_M = I_{LR}\angle$-pf

$$|V_{drop}| = IM \times [R\Omega \times \cos(-pf) - x\Omega \times \sin(-pf)]$$

$$\%V_{drop} = \frac{V_{drop}}{240V} \times 100\%$$