

**UNIVERSITY COLLEGE TATI (UC TATI)****FINAL EXAMINATION QUESTION BOOKLET**

COURSE CODE	:	BET 3023
COURSE	:	ELECTRICAL INSTALLATION AND PROTECTION
SEMESTER / SESSION	:	02 – 2024/2025
DURATION	:	3 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) List **seven (7)** factor requiring consideration during design of the power distribution system. (7 marks)
- b) Explain **two (2)** basic topologies in distribution systems with their diagram. (4 marks)
- c) State **four (4)** schemes in selecting Low Voltage Distribution. (4 marks)
- d) Explain **three (3)** acts of wiring regulation that need to be followed by electrical contractor. (3 marks)
- e) Generally, an electric light source can be divided into three types. List **three (3)** types of them. (3 marks)
- f) Compare the lighting system between lighting unit and lighting system environment. (4 marks)

## QUESTION 2

a) List **five (5)** type of final circuits distribution. (5 marks)

b) In Malaysia, the design criteria are developed by Tenaga Nasional Berhad (TNB) for steady state supply voltage level fluctuation of the low voltage system. Describe **two (2)** criteria of this system with their specification. (4 marks)

c) A shop has the following single-phase loads, which are balanced as evenly as possible across the 415V three-phase supply.

3 x 8 kW and 6 x 4 kW thermostatically controlled water heaters

3 x 4 kW instantaneous water heaters

3 x 4 kW and 2 x 3 kW cookers

16 kW of discharge lighting (Sum of tube ratings)

7 x 30A ring circuit feeding 13A sockets.

Analyse the total demand of the system, assuming that diversity can be applied. Calculations will be based on Appendix 1 (9 marks)

d) Describe **four (4)** the grounding devices included with the diagrams. (7 marks)

**QUESTION 3**

- a) Explain protection in electrical system (2 marks)
- b) State **two (2)** methods by which basic protection can be accomplished. (4 marks)
- c) The consumer's mains equipment must provide protection against overcurrent that is a current exceeding the rated value. State **four (4)** consideration factors for selecting a protective device. (4 marks)
- d) You are deciding to change the protection device at substation. Identify **five (5)** criteria that you have to consider for upgrading the system protection performance. (5 marks)
- e) In your experience, recommend the suitable size wire diameter according to current rating as shown in table 2 below. (3 marks)

Table 2

Current Rating (A)	Wire Diameter (mm)
8	
18	
24	

- f) Describe **two (2)** types of faults in grounding system with their solution. (7 marks)

**QUESTION 4**

- a) Give **three (3)** the most important protective devices used on MV lines in lightning protection. (3 marks)
- b) List **four (4)** major factors when the seriousness of an electric shock. (4 marks)
- c) Compare **four (4)** stages of the effect of a current flow through the body with the diagrams. (8 marks)
- d) Identify the value resistivity according type of the earth in Table 3 below (4 marks)

Table 3

Types of earth	Resistivity / ohm-meter
Wet organic soil	
Moist soil	
Dry soil	
Bed rock	

- e) Illustrate the method of planting earth electrode with the diagram of earth electrode. (6 marks)

.....END OF QUESTION.....

## APPENDIX 1: Allowance for diversity

Note the following abbreviations : <b>X</b> is the full load current of the largest appliance or circuit <b>Y</b> is the full load current of the second largest appliance or circuit <b>Z</b> is the full load current of the remaining appliances or circuits			
Type of final circuit		Type of premises	
	Households	Small shops, stores, offices	Hotels, guest houses
Lighting	66% total demand	90% total demand	75% total demand
Heating and power	100% up to 10 A + 50% balance	100%X + 75%(Y+Z)	100%X + 80%Y + 60%Z
Cookers	10 A + 30% balance + 5 A for socket	100%X + 80%Y + 60%Z	100%X + 80%Y + 60%Z
Motors (but not lifts)		100%X + 80%Y + 60%Z	100%X + 50%(Y+Z)
Instantaneous water heaters	100%X + 100%Y + 25%Z	100%X + 100%Y + 25%Z	100%X + 100%Y + 25%Z
Thermostatic water heaters	100%	100%	100%
Floor warming installations	100%	100%	100%
Thermal storage heating	100%	100%	100%
Standard circuits	100%X + 40%(Y+Z)	100%X + 50%(Y+Z)	100%X + 50%(Y+Z)
Sockets and stationary equip.	100%X + 40%(Y+Z)	100%X + 75%(Y+Z)	100%X + 75%Y + 40%Z