



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

**UNIVERSITY EXAMINATION FOR THE DEGREE IN SCIENCE IN RENEWABLE
ENERGY TECHNOLOGY AND MANAGEMENT**

2ND YEAR 1ST SEMESTER 2024/2025 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TEB 1207

COURSE TITLE: ELECTRICAL POWER APPLICATION

EXAM VENUE:

STREAM: BSc. REN ENGY TEC & MGT

DATE: 15 /1/2025

EXAM SESSION:14-16.00 HRS

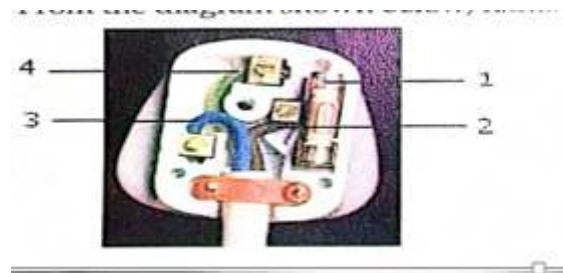
DURATION: 2 HOURS

Instructions

- 1. Answer question 1 (Compulsory) and ANY other two questions**
- 2. Candidates are advised not to write on question paper**
- 3. See attached Table 1 and 2**
- 4. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE

- a) List the general steps taken to design, install and wire an installation (6 Marks)
- b) Distinguish the following terms with the aid of a diagram (4 Marks)
 - I. Block diagram
 - II. Wiring diagram
 - III. Schematic diagram
 - IV. Pictorial Diagram
- c) Define the term safety (1 Mark)
- d) List any **FIVE** fundamental electrical rules used to avoid accidents (5 Marks)
- e) Identity the **FOUR** parts of the socket plug (4 Marks)



QUESTION TWO

- A) a) Explain how electricity is carried over long distance (1 Mark)
- b) **STATE** any **THREE** benefits of low voltage wiring (3 Marks)
- c) What is the importance of Electrical codes and standards? (1 Mark)
- d) Explain the importance of cable labeling, hence identify the following parameter depiction on Figure 1. (5 Marks)

PATEL DOSHI 2CX2.5 MM PVC/PVC KEBS QAS CERT 300/500

Figure 1

- B)
 - I. Explain MI cable (1 Mark)
 - ii. State **THREE** suitability of MI applications (3 Marks)
 - iii. Distinguish wire as a cable (1 Mark)
 - iv. With the aid of a diagram describe **ELCB** (4 Marks)
 - v. **STATE** Electrical safety precaution while handling electrical appliances. (1 Mark)

QUESTION THREE

A) A copper cable is laid from MDP to another panel board contain many circuits – Assume the following situations (Voltage level -350 Length L-1.2m, Insulator type- XLPE 3, Power factor-1, Panel Load-0.7 and Correction factor - 0.95 (Refer to Table

1)

- a. Determine design current (3 Marks)
- b. If factor affecting the installation at letter E are $f_0=1, f_1=0.91, f_2=0.88$. Calculate the CSA of the cable (3 Marks)
- c. Determine the new current and comment on the answer (2 Marks)
- d. What is cable sizing (1 Mark)

B) I. STATE the advantage of carrying out cable sizing (2 Marks)

II. The diagram in Figure 2 describe the single Multiple Luminaire connection to power supply, obtain the wire size (Ref to Table 2) (3 Marks)



Figure.2

- C) i. STATE switch gear classification (1 Mark)
ii. Identify any **THREE** advantages and **TWO** disadvantages of switch gears (5 Marks)

QUESTION FOUR

- A) i. State the main features of protective devices (3 Marks)
ii. Determine the fusing current for room wire whose cross section area 12.56 cm^2 and curve Constant $K = 2 \times 10^{-2}$ (3 Marks)
iii. Show the following terms on a graphical sketch (6 Marks)

- a. *Fusing factor*
- b. *Cutoff error*
- c. *Pre arching time*
- d. *Arching time*
- e. *Total operating time*

- B) i. List **TWO** factors that cable size depend on (2 Marks)
ii. Explain hazards in domestic circuits (2 Marks)

iii. A room, 10m x 5m x 4m, is to have an average illuminance of about 200 lx on a working plane 0.85 m above the floor. Assume the utilization factor to be 0.6 and allow for a maintenance factor of 0.8. Calculate the number of 200-W lamps to be installed and indicate

on a diagram a suitable arrangement. Assume each lamp, when new, to emit 2700 lm and a Spacing/height ratio of about 1.0 (4 Marks)

QUESTION FIVE

- a) i. STATE any **THREE** general rules of wiring (3 Marks)
- ii. Determine the total power to be consumed when the installation has the following accessories 3 Incandescent lamps, 2 ceiling fans, and 5 socket outlets (3 Marks)
- iii. Explain the markings **3x95+50mm²PVC/Cu** (3 Marks)
- iv. STATE any **TWO** reasons for power losses in cables (2 Marks)
- b) i. State **THREE** characteristics of DC generators (3 Marks)
- ii. Determine the main functions of **CB** (2 Marks)
- iii. The Acronym **ACB** stand for (1 Mark)
- iv) Explain the **THREE** components of a contactor (3 Marks)

TABLE ONE

Letter	Insulating Material and number of loaded conductors						
B	PVC 3	PVC 2		XLPE 3		XLPE 2	
C		PVC 3			XLPE 3		XLPE 2
E			PVC 3	XLPE 3	PVC 2	XLPE 3	
F				PVC 3		PVC 2	PVC 3
Copper CSA mm²							
1.5	15.5	17.5	18.5	19.5	22	23	24
2.5	21	24	25	27	30	31	39
4.0	28	32	34	36	40	42	45
6.0	36	41	43	48	51	54	75
10.0	50	57	60	63	70	75	100
16.0	68	76	80	85	94	100	127
25.0	89	96	101	112	119	127	158
35.0	110	119	126	138	147	158	192
50.0	134	144	153	168	179	192	246
70.0	171	184	196	213	229	246	298
95.0	207	223	238	258	278	298	328
120.0	239	259	276	299	322	346	441
185.0		299	319	344	371	395	506
240.0	341	364	392	424	450	599	598
300.0	403	430	461	500	538	693	699

TABLE TWO

24V WIRE SIZE TABLE

15W				25W				45W			
mm ²	AWG	Watts 24V	metres for 2V D	mm ²	AWG	Watts 24V	metres for 2V D	mm ²	AWG	Watts 24V	metres for 2V D
1.5mm	15	15	110	1.5mm	15	25	68	1.5mm	15	45	36
2.5mm	13	15	188	2.5mm	13	25	106	2.5mm	13	45	60
4mm	11	15	290	4mm	11	25	174	4mm	11	45	96
6mm	9	15	438	6mm	9	25	262	6mm	9	45	146
10mm	7	15	728	10mm	7	25	438	10mm	7	45	242
16mm	5	15	1142	16mm	5	25	686	16mm	5	45	380
25mm	3	15	1828	25mm	3	25	1098	25mm	3	45	610

160W				220W				280W			
mm ²	AWG	Watts 24V	metres for 2V D	mm ²	AWG	Watts 24V	metres for 2V D	mm ²	AWG	Watts 24V	metres for 2V D
1.5mm	15	160	10	1.5mm	15	220	8	1.5mm	15	280	6
2.5mm	13	160	16	2.5mm	13	220	12	2.5mm	13	280	10
4mm	11	160	28	4mm	11	220	20	4mm	11	280	16
6mm	9	160	42	6mm	9	220	30	6mm	9	280	24
10mm	7	160	68	10mm	7	220	50	10mm	7	280	38
16mm	5	160	108	16mm	5	220	78	16mm	5	280	62
25mm	3	160	172	25mm	3	220	124	25mm	3	280	98