



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST YEAR FIRST TERM EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

2601/105; ELECTRICAL INSTALLATION TECHNOLOGY I.

DATE: 8/6/2021

TIME: 2.30-5.30 PM

INSTRUCTIONS

Attempt any Five out of the following Eight Questions.

1.
 - a)
 - i Define the term safety with regard to an electrical workshop. (2 marks)
 - ii Explain two methods for the protection against the risk of an electrical shock (4 marks)
 - b)
 - i Describe with a diagram the construction of a 2-core paper Insulated lead sheathed steel wire armoured cable. (6 marks)
 - ii State any three purposes of installing bare and lightly insulated conductors in buildings. (3 marks)
 - c) State the following;
 - i. Any two disadvantages of the Protective Multiple Earthing system.
 - ii. Any three requirements for the effective use of Protective Multiple Earthing on a supply distribution system. (5 marks)
2.
 - a) A fixed cooking appliance has 2 hot plates rated at 2 KW each, 2 hot plates each rated at 1.5 KW, an oven rated at 1 KW and a grill rated at 700W. If the rated voltage of the cooker is 240V, determine the size of a cooker control Unit suitable to supply the appliance when it is to incorporate a socket outlet. (5 marks)
 - b) Define the following terms ;

- i. Earth – Continuity Conductor
 - ii. Consumer's earth resistance. (4 marks)
- c) Explain with a labeled diagram the current operated earth leakage circuit breaker. (6 marks)
- d)
 - i Describe the earth concentric wiring system .
 - ii State two advantages of earth concentric wiring system. (5 marks)
- 3. a)
 - i Define the term" wiring system". (3 marks)
 - ii State Three main functions of earthing an electrical system. (3 marks)
- b)
 - i State the IEE regulation B23 regarding the voltage drop in a consumers installation.
 - ii A 4.7 KW, 240V, 50Hz single phase load operating at full- load efficiency of 90% and 0.87 power factor lagging is to be supplied from a distribution board 90m away. Find the most suitable cable size from table 1 below to satisfy the load current and volt drop requirement. (8 marks)

Table 1

Cable size(mm ²)	6	10	16	25	35
Current rating (A)	77	105	140	180	220
Volt drop /A/m(mV)	7.0	4.4	2.8	1.8	1.3

- c) Describe the procedure for making a Tee-twist joint for conductors. (6 marks)
- 4. a) State the following
 - i Any two factors to be considered when choosing a wiring system.
 - ii Any two advantages of a non-metallic conduit wiring system. (4 marks)
- b) Describe the following types of fire extinguishers ;
 - i. Water
 - ii. Dry chemical powder. (4 marks)
- c) Define the term 'Conductor joint . (2 marks)
- d) state any one application of following tools :
 - i. hacksaw
 - ii. screwdriver . (2 marks)

- e) Demonstrate the Holger Nielsen method used as a first aid treatment to victims of an electric shock in an electrical workshop. (5 marks)
- f) Explain the flexible metallic conduit wiring system. (3 marks)
- 5. a) State three safety requirements with regard to an electrical installation to be observed as a precaution against an electric shock. (3 marks)
- b) Explain the following wiring systems
 - i. Cleated Wiring
 - ii. PVC sheathed. (6 marks)
- c) Show with a labeled diagram the earth fault loop path taken by a fault current in a consumer's installation. (4 marks)
- d) Define the following terms
 - i. Wiring Accessory
 - ii. Switch. (4 marks)
- e) State any three methods used for electrical conductor identification. (3 marks)
- 6. a) i Outline any three factors that affect current rating of electrical cables .
- ii A 2- core copper cable supplies current to a 240-v single – phase load of 20kw at 0.8 power factor lagging. the cable is 52 meters long and each conductor has a cross – sectional area of 35mm^2 . Determine the following;
 - I. The voltage drop in the cable
 - II. The power wasted in the cable .

Take resistivity of copper as $17.5\mu\Omega\text{mm}$. (8 marks)
- b) State the following;
 - i. Any three advantages of Copper rods as an earth electrode used for earthing connection to the ground.
 - ii. Any three properties of copper as a conductor material. (6 marks)
- c) Define the following terms ;
 - i. A Cable.
 - ii. Armouring. (4 marks)
- d) state any two disadvantages of water as an extinguishing agent of fire. (2 marks)
- 7. a) State the following ;
 - i. Any three advantages of a trunking wiring system.

- ii. Any three disadvantages of Class 'B' steel metal conduit system. (6 marks)
 - b) Define the following terms;
 - i. Earth electrode.
 - ii. Earthing lead. (4 marks)
 - c) Explain the two main causes of an Accident in Electrical workshops. (4 marks)
 - d) Describe the following tools used in workshops
 - i. Hand file
 - ii. Centre Punch. (6 marks)
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- a) draw circuit diagram showing how two lamps are wired using ;
 - i. four – plate ceiling rose.
 - ii. loop – in method at switch position. (4 marks)
 - b) i State any two precautions necessary while using a hammer in a striking operation. (2 marks)
 - ii Explain the steps involved in the filing operation performed by a hand file . (3 marks)
 - c) Explain the following classes of fires that are common in Industry ;
 - i. Class ' A ' fire
 - ii. Class ' B ' fire (4 marks)
 - d) Explain the following term
 - i. Sheathing
 - ii. Flexible cable (4 marks)
 - e) State any three reasons why it is necessary to carry out cable sizing calculations. (3 marks)