



MACHAKOS UNIVERSITY

University Examinations for 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA IN

ELECTRICAL AND ELECTRONICS ENGINEERING

EED 212: ELECTRICAL INSTALLATION TECHNOLOGY IV

DATE: 5/6/2017

TIME: 2:00 – 4:00 PM

INSTRUCTIONS

Answer question ONE and any other two questions

QUESTION ONE (COMPULSORY) (30 MARKS)

- (a) Define the following terms:-
- a. Heat
 - b. Temperature (4 marks)
- (b) Differentiate between the following terms conduction and convection as used in heat transfer. (2 marks)
- (c) (i) State any **FOUR** factors to be considered when designing methods of heating a room (4 marks)
- (ii) A drawing office, 25m by 10m with ceiling height of 9m, has four doors each of area 2m^2 and 12 windows each of 1.0m^2 . The office is to have electric heating sufficient to maintain an average inside temperature of 16°C when the outside walls, ceiling and floor is 0°C

Given the following Heat transfer coefficients:

Floor – timber on concrete $0.85 \text{ W/m}^2 \text{ }^\circ\text{C}$

Ceiling – plaster $0.99 \text{ W/m}^2 \text{ }^\circ\text{C}$

Walls – brick and plaster $1.76 \text{ W/m}^2 \text{ }^\circ\text{C}$

Doors –wood $2.84 \text{ W/m}^2 \text{ }^\circ\text{C}$

Windows –double glazing $2.9 \text{ W/m}^2 \text{ }^\circ\text{C}$

Specific heat capacity $1010 \text{ J/kg }^\circ\text{C}$

Density of air 1.292 kg/m^3

Calculate the KW rating of the heaters assuming two complete changes of air per hour. (10 marks)

- (d) A Water tank containing 90 litres of water at 10°C is heated at an efficiency of 90 per cent by 10 kW immersion heater. Find the time needed to raise the temperature of the water to 85°C . (Specific heat capacity of water is $4187 \text{ J/kg }^\circ\text{C}$ and 1kg of water equals to 1 litre) (6 marks)
- (e) With aid of labeled diagram describe, the convector heater (4 marks)

QUESTION TWO (20 MARKS)

- (a) Describe the following electric water heating systems: -
(i) Electric geysers
(ii) Local storage (4 marks)
- (b) With aid of well labeled diagram describe, the non - pressure type water heating systems. (10 marks)
- (c) A water heater holds 300 litres of water. Calculate the rating in kW of the electric immersion heater which will raise the temperature of the water from 4°C to 85°C in 45 minutes, assuming an efficiency of 90 per cent. (Specific heat capacity of water is $4187 \text{ J/kg }^\circ\text{C}$. (6 marks)

QUESTION THREE (20 MARKS)

- (a) (i) Define the following terms in relation with
I. Hazardous Area
II. Flash Point. (4 marks)
- (ii) Distinguish between the following terms Zone 2 and Damp Situation (2 marks)
- (b) (i) State THREE IEE regulation governing electric motors in agricultural and Horticultural installations. (3 marks)
- (ii) With aid of a well labeled diagram, describe the operation of Zener diode safety barrier circuit. (11 marks)

QUESTION FOUR (20 MARKS)

- (a) Describe the following faults common in underground cables.
(i) Open circuit
(ii) Earth leakage fault (4 marks)
- (b) With aid of a well labeled circuit diagram, describe the Murray loop test method used to locate the position of earth fault in underground cables. (8 marks)
- (c) Find the location of an earth fault in a cable of length 260m. The measured resistance of the faulty conductor is $0.3803\Omega/\text{m}$. And the null point is at resistance of 68Ω against the constant resistance of 23Ω . (8 marks)

QUESTION FIVE (20 MARKS)

- (a) State:
(i) THREE factors to consider when choosing motor for a particular installation
(ii) FOUR IEE wiring regulation requirements for installation of motors (7 marks)
- (b) Describe the following types of motor enclosures:
(i) Open type
(ii) Screen protected (5 marks)
- (c) With aid of labeled diagrams, describe the following methods:
(i) Vee belts
(ii) Multiple rope drives (8 marks)