



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

CERTIFICATE IN ELECTRICAL AND ELECTRONIC ENGINEERING (TVET)

ELECTRICAL INSTALLATION TECHNOLOGY I.

DATE: 18/4/2019

TIME: 2.30-10.30 AM

INSTRUCTIONS:

Attempt any five questions of the following Eight questions.

QUESTION ONE (20 MARKS)

- a) Define the following terms with regard to measurements;
- i. Repeatability
 - ii. Sensitivity of measurement. (4 marks)
- b) i State any three advantages of a PMMC instruments . (3 marks)
- ii Describe with the aid of a diagram the construction of a PMMC instrument. (10 marks)
- c) i A PMMC instrument has a coil of dimensions $15\text{mm} \times 12\text{mm}$ with the flux density in the air gap being $1.8 \times 10^{-3} \text{ Wb/m}^3$ and the spring constant is $0.14 \times 10^{-6} \text{ Nm/rad}$. Determine the number of turns required to produce an angular deflection of 90 degrees when a current of 5mA is flowing through the coil. (3 marks)

QUESTION TWO (20 MARKS)

- a) Explain the following terms with regard to protection devices;
- i. Current Rating

- ii. Fusing Factor. (4 marks)
- b) Describe with the aid of a diagram the operation of an electromagnetic overload trip. (6 marks)
- c) Define the following terms with regard to consumer circuits;
 - i. Distribution Board
 - ii. Final sub – circuit. (4 marks)
- d) State the following
 - i. Any three essential features of a consumer's intake point as required by the IEE regulations.
 - ii. Any three advantages of a circuit breaker over any type of fuse. (6 marks)

QUESTION THREE (20 MARKS)

- a) Define the following terms with regard to measurements ;
 - i. Instrument efficiency
 - ii. Accuracy. (4 marks)
- b) Explain with a labeled diagram the Air Friction damping method used in indicating instruments. (6 marks)
- c) Describe with the aid of a diagram the Boiling Water Reactor used in a Nuclear Power Plant. (6 marks)
- d) State the following
 - i. Any two IEE regulation requirements of a domestic ring final circuit
 - ii. Any two IEE regulation requirements of an electric motor final sub – circuit. (4 marks)

QUESTION FOUR (20 MARKS)

- a) Describe the following types of tools used in Electrical workshops ;
 - i. Bench Vice. (3 marks)
 - ii. Hacksaw. (3 marks)
- b) i Explain the steps involved in the filing operation performed by a hand file tool. (3 marks)
- ii State any three precautions that are required while using an Hacksaw tool. (3 marks)

- c) i Show with the aid of a labeled diagram the sequence of control equipment at the intake point of a two – wire consumer installation .
- ii State the functions of any two control equipment in Q4(c)(i) above. (6 marks)
- d) State any two Advantages of a Pressurised Water Reactor used in Nuclear Power Plants. (2 marks)

QUESTION FIVE (20 MARKS)

- a) With the aid of a labeled line diagram show a typical power supply system layout indicating standard voltages at every stage. (4 marks)
- b) A moving coil instrument gives a full scale deflection of 10 mA when the potential difference across its terminals is 100 mV . Calculate the following ;
 - i. The shunt resistance for a f.s.d corresponding to 100 A
 - ii. The series resistance for a f.s.d corresponding to 1000 V.
 - iii. The Power dissipation in both (i) and (ii) above . (6 marks)
- c) Explain with the aid of a labeled diagram the construction of a High – Breaking capacity fuse . (6 marks)
- d) i Define the National Grid system with regard to Kenya . (2 marks)
- ii State any two essential construction requirements of a Multiplier used to extend the voltage range of a basic meter movement . (2 marks)

QUESTION SIX (20 MARKS)

- a) Explain the following classes of Fuses ;
 - i. Class P fuses
 - ii. Class Q1 fuses. (4 marks)
- b) In the measurement of resistance R, using the Voltmeter – Ammeter method, the current and voltage measured were found to be 2A and 180V respectively. If the resistance of the voltmeter and ammeter are 2000Ω and 0.01Ω respectively , calculate ;
 - i. The True value of R
 - ii. The percentage error in calculating resistance R. (5 marks)
- c) State the following ;
 - i. Any two Disadvantages of a Hydro – electric power plant.

- ii. Any three Advantages of a Pumped storage hydro – electric plant. (5 marks)
- d) Describe with the aid of a labeled diagram the operation of an Overload trip with oil dashpot time lag. (6 marks)

QUESTION SEVEN (20 MARKS)

- a)
 - i State any three characteristics of a moving coil instrument. (3 marks)
 - ii With the aid of a labeled diagram describe the principle of operation of attraction – type moving Iron Instruments. (7 marks)
- b)
 - i Explain the chipping operation carried out by a flat chisel tool. (3 marks)
 - ii State any three precautions necessary while using an hammer in a striking operation . (3 marks)
- c) Explain any two factors considered in the site selection for an Hydro – electric power plant. (4 marks)

QUESTION EIGHT (20 MARKS)

- a) Show a labeled water – steam flow diagram of a thermal power plant. (4 marks)
- b) Describe the functions of the following types of auxiliary equipments for a thermal power plant;
 - i. Condenser
 - ii. Economiser. (6 marks)
- c) Describe the following classes of Hydro – electric power plants;
 - i. Run off river plants without pondage.
 - ii. Low head plants. (6 marks)
- d) State the following ;
 - i. Any two advantages of an electromagnetic overload trip.
 - ii. Any two disadvantages of a rewirable fuse. (4 marks)