



MACHAKOS UNIVERSITY

University Examinations for 2020/2021

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS STATISTICS

FIRST YEAR SECOND TERM EXAMINATION FOR

DIPLOMA/CERTIFICATE IN ELECTRICAL ENGINEERING.

2601-105-EIT: ELECTRICAL INSTALLATION TECHNOLOGY I

DATE: 2/9/2021

TIME: 2:30 – 5:30 AM

INSTRUCTIONS:

Attempt any five questions of the following Seven questions.

- I
- a) Show with the aid of a wiring diagram the following ;
 - (i) A One – Way switch control of two lamps
 - (ii) Two 2 – way switch control of two lamps. (4 marks)
 - b)
 - (i) State any three advantages of a Permanent Magnet Moving Coil (PMMC) instruments . (3 marks)
 - (ii) Describe with the aid of a labeled 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)

2. (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 labeled 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 circuit. (4 marks)
- (d) State the following;
- (i) Any three essential features of a consumers intake point as required by the IEE regulations . (3 marks)
 - (ii) Any three advantages of a circuit breaker over any type of fuse. (3 marks)
3. (a) Define the following terms with regard to measurement systems ;
- (i) Instrument efficiency
 - (ii) Accuracy . (4 marks)
- (b) Explain with the aid of a labeled diagram the Air Friction damping method used in indicating instruments. (6 marks)
- (c) Explain with the aid of labeled diagrams the following power distribution systems;
- (i) d.c two - wire system . (3 marks)
 - (ii) a.c single – phase two - wire system . (3 marks)
- (d) State the following ;
- (i) Any two IEE regulation requirements of a domestic ring final circuit
 - (ii) Any two advantages of a high breaking capacity fuse . (4 marks)

4. (a) State the following ;
- (i) Any two advantages of an electromagnetic overload trip.
 - (ii) Any three disadvantages of a rewirable fuse. (5 marks)
- (b) Explain any three types of forces required for the satisfactory operation of an electrical indicating instrument. (6 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 . (4 marks)
- (iii) State the functions of any three control equipment in Q4(c)(i) above. (3 marks)
- (iii) Define the term ‘ close excess current protection ‘ . (2 marks)
5. (a) With the aid of a labeled 2- line diagram show a typical power supply system layout indicating standard voltages at every stage. (4 marks)
- b) A moving coil instrument gives a f.s.d 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)
6. (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) Define the following terms ;
 - (i) Contactor
 - (ii) Circuit breaker . (4 marks)
 - (d) Describe with the aid of a labeled diagram the operation of an Overload trip with oil dashpot time lag. (7 marks)
7. (a) (i) Explain the eddy current damping method used in electrical analogue instruments. (4 marks)
- (b) With the aid of a labeled diagram describe the principle of operation of attraction – type moving Iron Instruments. (7 marks)
- (c) Consider a PMMC instrument which gives f.s.d at 50 mV p.d. and 10 mA current.
Calculate the following ;
- (i) The shunt resistance required to extend the instrument as an ammeter with 0 – 10A range
 - (ii) The series resistance required to extend the instrument as a voltmeter with 0 – 250 V range. (5 marks)
- (d) State any four advantages of the national grid system. (4 marks)