



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

ELECTRICAL PRINCIPLES II

DATE: 30/4/2019

TIME: 8.30-10.30 AM

INSTRUCTIONS:

Answer question one and any other two questions

QUESTION ONE (30 MARKS)

- a) i Define a magnet (1 mark)
- ii State four properties of magnetic lines of force (4 marks)
- iii A flux density of 1.2T is produced in a piece of cast steel by a magnetizing force of 1250A/m. Find the relative permeability of the steel under these conditions. (7 marks)
- b) i Define transformer efficiency and give its symbol. (3 marks)
- ii Name four transformer losses (4 marks)
- iii A transformer has 500 primary turns and 3000 secondary turns. If the primary voltage is 240V, determine the secondary voltage, assuming an ideal transformer. (5 marks)
- c) i Draw the symbol for an air cored inductor (2 marks)
- Draw a typical hysteresis loop and on it identify: (a) saturation flux density (b) remanence (c) coercive force. (4 marks)

QUESTION TWO (20 MARKS)

- a) Define the following terms
 - i. Magnetomotive force
 - ii. magnetic field intensity (5 marks)
- b) Using diagrams, explain how domains in an unmagnetized piece of iron differ from those of a magnetized one. (5 marks)
- c) i An 8H inductance has a current of 3A flowing through it. How much energy is stored in the magnetic field of the inductor? (5 marks)
 - ii State five practical applications of magnets (5 marks)

QUESTION THREE (20 MARKS)

- a) i Explain six uses of electromagnetism (5 marks)
 - ii Explain the principle of operation of a moving coil instrument (5 marks)
- b) i Draw a solenoid and show the positions of North and South poles on it given a definite current direction. (4 marks)
 - ii At what velocity must a conductor 75mm long cut a magnetic field of flux density 0.6T if an e.m.f. of 9V is to be induced in it? Assume the conductor, the field and the direction of motion are mutually perpendicular. (6 marks)

QUESTION FOUR (20 MARKS)

- a) i Define inductance and give its symbol. (3 marks)
 - ii Name factors that affect inductance of an inductor. (4 marks)
- b) i Define mutual inductance (1 mark)
 - ii Explain “relative permittivity” as used in magnetism. (5 marks)
 - iii Two coils have a mutual inductance of 0.2 H. If the current in one coil is changed from 10A to 4A in 10 ms, calculate (a) the average induced e.m.f. in the second coil, (b) the change of flux linked with the second coil if it is wound with 500 turns. (7 marks)

QUESTION FIVE (20 MARKS)

- a)
 - i With an aid of a diagram, explain how an auto transformer works (5 marks)
 - ii Show that $E_1/E_2 = N_1/N_2$ for an ideal transformer (4 marks)
- b)
 - i List three advantages of electromagnetism over permanent magnets (3 marks)
 - ii A 4500V/225V, 50 Hz single-phase transformer is to have an approximate e.m.f. per turn of 15V and operate with a maximum flux of 1.4T. Calculate (a) the number of primary and secondary turns and (b) the cross-sectional area of the core. (8 marks)
 - iii Explain the difference between hysteresis of soft iron from that of steel