



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

THIRD YEAR SECOND SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING

EED310: ELEMENTS OF POWER SYSTEMS II

DATE: 10/5/2019

TIME: 8.30-10.30 AM

INSTRUCTIONS:

ANSWER QUESTION ONE AND ANY OTHER TWO TIME 2HRS

QUESTION ONE (30 MARKS)

- a) Explain the following terms with reference to Faults
- i. positive sequence
 - ii. negative sequence
 - iii. a' operator (6 marks)
- b) List the assumptions made in analysis of asymmetrical faults (4 marks)
- c) Explain the following terms with reference to protection
- i. Pick up value
 - ii. Actuating quantity (4 marks)
- d) In a 3-Phase, 4-wire system the currents in the RYB are
- $I_R = 200 \angle 60^\circ \text{ A}$ $I_Y = 50 \angle 150^\circ \text{ A}$ $I_B = 70 \angle 180^\circ \text{ A}$
- Calculate all the sequence currents in the R (10 marks)
- e) Explain the Three zones of protection of a power system element (6 marks)

QUESTION TWO (20 MARKS)

- a) With reference to Three phase fault studies, explain the terms;
- i. Asymmetrical Faults
 - ii. Symmetrical Faults (4 marks)
- b) Derive an expression for Negative sequence in three phase faults (6 marks)
- c) The sequence voltages in the red phase are
- $$E_{R0} = 150V \quad E_{R1} = 160 - j80V \quad E_{R2} = -100V$$
- Calculate E_r, E_y, E_b (10 marks)

QUESTION THREE (20 MARKS)

Explain with the aid of diagrams the operation of

- a) horn gap
- b) arcing horn
- c) earth wire (20 marks)

QUESTION FOUR (20 MARKS)

- a) With the aid of a diagram, explain the operation of the Peterson coil (14 marks)
- b) list the Six routine procedures of maintenance of overhead lightning arresters (6 marks)

QUESTION FIVE (20 MARKS)

- a) Explain the following terms with reference to line classifications
 - i. Voltage regulation
 - ii. Transmission efficiency (6 marks)
- b) Explain any THREE types of overhead line classification (4 marks)
- c) Explain any FIVE characteristics of a desirable protection (10 marks)