



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

**FIRST SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL AND
ELECTRONICS ENGINEERING**

EED 301: ELEMENTS OF POWER SYSTEM 1

DATE: 4/8/2016

TIME: 2:00 – 4:00 PM

INSTRUCTIONS

Answer Question One And Any Other Two Questions In Section B

1.
 - 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)
 - d) In a 3-Phase, 4-wire system, the currents in the RYB are
$$I_R = 100 \angle 30^\circ \text{ A} \quad I_Y = 50 \angle 300^\circ \text{ A} \quad I_B = 30 \angle 180^\circ \text{ A}$$
Calculate all the sequence currents in (10 marks)
2.
 - 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

$$E_{R0} = 200V \quad E_{R1} = 50-j85V \quad E_{R2} = -150V$$

Calculate E_r, E_y, E_b (10 marks)

3. a) List any FOUR cause of surges (4 marks)
b) Derive the expression for surge velocity. (6 marks)
c) With the aids of a diagram explain the operation of the attraction type relay

- i) Attraction type
ii) Solenoid type
iii) Balanced beam (10 marks)

4. a) List any FOUR causes of Faults in power system (6 marks)
b) Prove the following identities

i) $1 - a^2/a - a^2 = -a$

ii) $1 - a/1 + a^2 = 1 - a^2$ (6 marks)

- c) In a 3-Phase, 4-wire system, the currents in the RYB are

$$I_R = 200 \text{ at } 60^\circ \text{ A} \quad I_Y = 60 \text{ at } 150^\circ \text{ A} \quad I_B = 70 \text{ at } 180^\circ \text{ A}$$

Calculate all the sequence currents in the R line (8 marks)

5. a) Derive an expression for sending end voltage and current using nominal Π method (5 marks)

- b) A three phase 132kV, 50Hz overhead transmission line 150Km long has the following per phase constants

Resistance $0.14\Omega/\text{km}$

Inductance $1.3\text{mH}/\text{km}$

Capacitance $0.0090\mu\text{F}/\text{km}$

The line supplies a load of 80MW at 0.8p.f lagging. Using nominal T method .determine

- i) current
ii) voltage
iii) power factor . (15 marks)