



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of Electrical and Electronic engineering

Higher Diploma in Electrical Power Engineering

EEE3214: ELECTRICAL POWER SYSTEMS III

END OF SEMESTER EXAMINATION

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** Questions;. Attempt any **THREE** Questions.

Do not write on the question paper.

Question One

- (a) (i) Define corona
(ii) State TWO advantages and TWO disadvantages of corona
(iii) State two methods of reducing corona effect
(8 marks)
- (b) Explain the following terms with reference to corona :
(i) Critical disruptive voltage
(ii) Visual critical voltage
(iii) Power loss due to corona
(6 marks)
- (b) A 3-phase overhead transmission line, consists of three stranded copper conductors spaced 2.5 m apart at the corners of an equilateral triangle. The air temperature and pressure are 21°C and 73.6 cm Hg respectively. The conductor diameter and irregularity factor are 10.4 mm and 0.85,
Determine the disruptive critical voltage
(6 marks)

Question TWO

- (a) Define the following protection terms,
(i) Pickup level
(ii) Primary relays
(iii) Secondary relays
(iv) Unit protection
(v) Non unit protection
(5 marks)
- (b) Explain THREE methods of achieving time delay in inverse time relays (6 marks)
- (c) A 30 MVA, 33/11 kV three phase delta star transformer is protected by a differential relay. The CT current ratio on the primary is 500:5 and that on the secondary is 2000:5
Determine the relay current setting for faults drawing up to 200 percent of the rated current.
(9 marks)

Question THREE

- (a) Explain the following ;
- (i) Voltage regulation
 - (ii) Transmission efficiency
- (4 marks)
- (b) Distinguish between the three classes of transmission line and how line parameters affect each class. (3 marks)
- (c) A 200 km long 60hz transmission line supplies a 100 MW star connected load at 215KV (line to line) 0.9 pf lag. The per phase parameters of the line are Resistance 2.07 Ω , inductance 310.8mH and capacitance 1.4774 μ F.
Determine;
- (i) The ABCD constants for the line
 - (ii) The sending end voltage
- (13marks)

Question FOUR

- (a) (i) State Four methods of grounding
(ii) State Two advantages and Two disadvantages of each
- (8 marks)
- (b) Explain the phenomenon of arcing grounds and the methods used to minimize this phenomenon (3 marks)
- (c) A 132 kV, 3-phase, 50 Hz transmission line 192 km long consists of three conductors of effective diameter 20 mm, arranged in a vertical plane with 4 m spacing and regularly transposed. Find the inductance and kVA rating of the arc suppressor coil in the system. (9 marks)

Question FIVE

- (a) Explain how an arc is initiated and sustained in a circuit breaker when the circuit breaker contacts separate.
- (3 marks)
- (b) Explain the electronegativity of SF₆ gas and state its four characteristic (6 marks)
- (c) Explain the terms ;
- (i) Symmetrical breaking current
 - (ii) Asymmetrical breaking current

- (iii) making current
- (iv) Current chopping

(8 marks)

(d) A circuit breaker is rated as 2500 A, 1500 MVA, 33 kV, 3 secs, 3-phase oil C.B.

Determine;

- (i) Normal rated current
- (ii) Breaking current
- (iii) Short time rating

(3 marks)