UGANDA INSTITUTE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
END OF SEMESTER EXAMINATIONS

ACADEMIC YEAR 2025/2026

PROGRAMME(S): DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING (DEEE)

YEAR OF STUDY: YEAR TWO SEMESTER TWO

COURSE: ELECTRICAL POWER TRANSMISSION AND DISTRIBUTION

COURSE CODE : ELT2201

DATE: SATURDAY 27TH, JUNE 2026

TIME: 2:00 PM – 5:00 PM

DURATION: 3 HOURS

VENUE: TENT B

INSTRUCTIONS:

i. This paper contains of Two (2) sections A and B
ii. Section A is compulsory and carries 40 marks
iii. Section B contains 5 questions, each with 20 Marks, Attempt only 3 Questions
iv. Show all workings where applicable

SECTION A (40 MARKS)

PART I: OBJECTIVE QUESTIONS (10 MARKS)

Choose the most correct answer.

1. Which of the following is a major advantage of an interconnected power system?
   A. Reduced transmission losses
   B. Reduced reliability
   C. Increased reliability of supply
   D. Reduced consumption of power
   (1 Mark)

2. The main function of an insulator in an overhead line is to:
   A. Increase current flow
   B. Support conductors mechanically and electrically isolate them from earth
   C. Reduce conductor resistance
   D. Increase transmission voltage
   (1 Mark)

3. Which conductor is most widely used for transmission and distribution lines?
   A. Copper
   B. Aluminum
   C. ACSR
   D. Steel
   (1 Mark)

4. Bundled conductors are mainly used to:
   A. Reduce sag
   B. Increase weight of conductors
   C. Reduce corona losses
   D. Increase tower height
   (1 Mark)

5. Pin-type insulators are normally used for voltages up to:
   A. 11 kV
   B. 22 kV
   C. 33 kV
   D. 132 kV
   (1 Mark)

6. Which support is commonly used for long-distance high-voltage transmission lines?
   A. Steel towers
   B. RCC poles

C. Wooden Poles
D. Tubular poles
(1 Mark)

7. The lowest point of a conductor suspended between two supports is known as:
   A. Span
   B. sag point
   C. Dip point
   D. Midpoint
   (1 Mark)

8. Which of the following is NOT a property of a good conductor material?
   A. High conductivity
   B. High tensile strength
   C. High resistance
   D. Low specific gravity
   (1 Mark)

9. A double-circuit transmission line carries:
   A. One conductor
   B. Two conductors
   C. Two separate circuits on the same support structure
   D. Three conductors only
   (1 Mark)

10. Which insulator is commonly used at dead ends and sharp corners of transmission lines?
    A. Pin insulator
    B. Suspension insulator
    C. Stay insulator
    D. Strain insulator
    (1 Mark)

PART II: SHORT ANSWER QUESTIONS (30 MARKS)

Question 1

State five advantages of an interconnected power system. **(5 Marks)**

Question 2

Differentiate between:

(a) Overhead transmission lines and underground cables. **(2 Marks)**

(b) Single-circuit and double-circuit transmission lines. **(3 Marks)**

Question 3

State five properties of a good conductor material used in transmission lines. **(5 Marks)**

Question 4

Explain the functions of the following overhead line components:

(a) Conductors

(b) Supports

(c) Insulators

(d) Cross-arms

(e) Lightning arresters

(5 Marks)

Question 5

List five advantages of suspension insulators over pin-type insulators. **(5 Marks)**

Question 6

State five factors that affect sag and tension in overhead transmission lines. **(5 Marks)**

SECTION B

Answer ANY THREE Questions

QUESTION ONE (20marks)

Erioru Engineering Ltd has been contracted by the Uganda Electricity Transmission Company Limited (UETCL) to maintain a 132 kV transmission line crossing the River Nile. During hot afternoons, engineers have observed excessive conductor sagging, resulting in reduced ground clearance and raising safety concerns among nearby communities.

Required:

(a) Explain the meaning of conductor sag and why it is necessary in overhead transmission lines. **(5 Marks)**

(b) State four factors that influence conductor sag and tension in overhead transmission lines. **(5 Marks)**

(c) Explain the dangers associated with excessive sag in transmission lines. **(5 Marks)**

(d) As a transmission engineer at Erioru Engineering Ltd, recommend engineering measures that can be taken to reduce excessive sag while maintaining safety. **(5 Marks)**

QUESTION TWO (20MARKS)

Distribution systems form the final stage of the power system and are responsible for delivering electrical energy from substations to consumers in a safe and reliable manner.

Using your knowledge of distribution systems, answer the following questions:

(a) Define a distribution system and describe the general flow of electrical power from generation to consumers. (3 marks)
(b) Explain the functions of the following components of a distribution system:

i. Distribution Substation. (2 marks)
ii. Feeders. (2 marks)
iii. Distributors. (2 marks)
iv. Service mains. (2 marks)

(c) Describe the three types of distribution systems: radial, ring main, and interconnected systems, highlighting one advantage and one disadvantage of each. (6 marks)
(d) Differentiate between feeders and distributors in terms of current flow, design criteria, and consumer connections. (3 marks)

QUESTION THREE (20 MARKS)

Kimbugwe Engineering Ltd has been awarded a rural electrification contract in the mountainous districts of western Uganda. The proposed transmission line route will pass through deep valleys, steep slopes, rocky terrain, and densely forested areas.

Required:

(a) Explain the challenges likely to be encountered during the construction of the transmission line. **(5 Marks)**

(b) As a project engineer at Kimbugwe Engineering Ltd, recommend suitable line supports for the project and justify your answer. **(5 Marks)**

(c) Explain why proper earthing of transmission towers is necessary in such terrain. **(5 Marks)**

(d) Discuss the maintenance practices required to ensure reliable operation of the transmission line throughout its service life. **(5 Marks)**

QUESTION FOUR (20 MARKS)

An industrial park supplied through a transmission line maintained by **Gregory Engineering Services Ltd** has experienced frequent insulation failures during the rainy season, leading to power interruptions and increased maintenance costs.

Required:

(a) Explain the functions of insulators in overhead transmission systems. **(5 Marks)**

(b) Compare porcelain, glass, and polymer insulators used in transmission systems. **(5 Marks)**

(c) As an engineer at Gregory Engineering Services Ltd, recommend the most suitable insulator for a highly polluted industrial environment and justify your answer. **(5 Marks)**

(d) Explain how regular inspection and maintenance can reduce insulator failures and improve system reliability. **(5 Marks)**

QUESTION FIVE (20 MARKS)

Kiwunda Engineering Consultants Ltd has been engaged to design and improve an electrical distribution network supplying power to consumers in a rural district in Uganda. The company is required to ensure reliable power delivery while minimizing technical losses.

Required:

(a) Explain why distribution systems are located close to consumers and discuss the importance of minimizing transmission distance. **(4 Marks)**

(b) Explain the causes of voltage drop and power losses in distribution feeders, especially in rural electrification systems. **(2 Marks)**

(c) Explain how wind and ice loading affect sag and tension in transmission lines. **(5 Marks)**

(d) State four precautions that should be considered when determining conductor sag in transmission line design. **(5 Marks)**

(e) A load of 100 kW at a power factor of 0.9 is supplied at 415 V.

Calculate the current drawn by the load. **(4 Marks)**

END