Roll No.											

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations –December 2025

Date: 19 / 12/ 2025 **Time:** 01.00 pm to 04.00 pm

School: School of Engineering	**Program:** B. Tech (EEE)	
Course Code: EEE2029	**Course Name:** Transmission and Distribution	
Semester: V	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**12**	**22**	**22**	**22**	**22**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks.		**10Q x2M=20M**		
1	While planning a long-distance power transfer between two cities, the engineer suggests using high voltage. Based on this scenario, list the benefits of using higher voltage for power transmission.	**2 Marks**	**L1**	**CO1**
2	A power plant team is comparing two options—AC transmission and DC transmission—for a new line. From this situation, list any two differences between AC and DC transmission systems.	**2 Marks**	**L1**	**CO1**
3	A new substation is being set up in your town. In this context, list the main components of a transmission system and state their basic functions.	**2 Marks**	**L1**	**CO1**
4	An engineer is explaining why transmission towers carry only three wires while a street distribution line carries four. From this scenario, state why transmission lines use 3-phase 3-wire circuits and distribution lines use 3-phase 4-wire circuits.	**2 Marks**	**L2**	**CO1**
5	A utility company is reviewing the different AC transmission methods used across its network. In this scenario, list the various types of AC transmission systems.	**2 Marks**	**L2**	**CO1**
6	A distribution engineer needs to explain how electricity is delivered first to neighborhoods and then to homes. Based on this, list the key	**2 Marks**	**L2**	**CO1**

	differences between primary and secondary distribution systems.			
7	During a transmission line design meeting, the team discusses different conductor arrangements for inductance calculations. From this scenario, identify the basic types of transmission line configurations.	2 Marks	L2	CO2
8	A design engineer is categorizing lines as short, medium, or long. In this context, state the typical distance and voltage range that classify a line as a short transmission line.	2 Marks	L2	CO3
9	A maintenance team is checking insulator strings on a transmission tower. Based on this situation, define string efficiency and mention one simple way to improve it.	2 Marks	L2	CO4
10	In a classroom exercise on city power distribution, students are asked to sketch a ring main system. In this scenario, draw the single line diagram of an AC ring main system.	2 Marks	L2	CO5

Part B

Answer the Questions Total 80 Marks.

11.	**a.**	A power utility company is planning to expand its transmission network to connect a new 220 kV substation located 120 km away from the existing grid. Before finalizing the design, the engineering team must evaluate various aspects that influence the choice of a suitable transmission system. As a planning engineer, identify and list the important factors you would consider while selecting the most appropriate transmission system for this project.	**10 Marks**	**L2**	**CO2**
	b.	During the design review for the same project, you are asked to evaluate the inductive characteristics of a proposed single-circuit transmission line. The line consists of two parallel conductors spaced 1 meter apart, each having a diameter of 1.25 cm. Calculate the loop inductance per km of the line, and determine the line reactance if the operating frequency is 50 Hz.	**10 Marks**	**L3**	**CO2**

or

12.	**a.**	A high-voltage transmission corridor is being upgraded from a single conductor system to a bundled conductor configuration to improve performance. As the system design engineer, you are required to brief the management team on this modification. Explain how using bundled conductors reduces the overall inductance and capacitance of high-voltage transmission lines and describe how these changes improve power transmission efficiency.	**10 Marks**	**L2**	**CO2**
	b.	For the upgraded corridor, a 3-phase, 50 Hz, 66 kV overhead transmission line is proposed. The conductors a, b, and c lie in a horizontal plane with spacings: a–b = 2 m	**10 Marks**	**L3**	**CO2**

		b–c = 2.5 m a–c = 4.5 m The conductor diameter is 1.25 cm, and the line length is 100 km. Assuming the line is completely transposed, calculate: i) the capacitance per phase ii) the charging current per phase			

13.	**a.**	The Karnataka Power Transmission Corporation Ltd. (KPTCL) is planning to strengthen its regional grid by transferring 110 kV power from the Bengaluru receiving station to the Mysuru receiving station, a major intercity corridor with increasing load demand. As the transmission planning engineer responsible for this project: Identify the most suitable type of transmission line for transferring 110 kV over this route and justify your selection based on technical, economic, and operational factors. Additionally, explain how you would determine the voltage regulation and transmission efficiency of this line, and support your explanation using appropriate vector (phasor) diagrams.	**10 Marks**	**L3**	**CO3**
	b.	A state electricity board is evaluating the performance of a single-phase overhead transmission feeder that supplies power to a remote agricultural pumping station. The feeder is required to deliver 1000 kW at 33 kV with a 0.85 lagging power factor at the receiving end. The total line resistance is 15 Ω and the line reactance is 20 Ω, owing to the long rural stretch and conductor type used. As the senior transmission performance engineer, you are asked to assess how efficiently this feeder operates under the given loading conditions. Calculate: i) The sending-end voltage required to maintain the specified load conditions. ii) The sending-end power factor of the feeder. iii) The overall transmission efficiency of the feeder. Your solution should clearly apply standard transmission-line performance equations used for evaluating single-phase systems.	**10 Marks**	**L4**	**CO3**

or

14.	**a.**	A new batch of graduate engineer trainees in your transmission planning division is undergoing training in power system modelling techniques. While studying transmission-line behaviour, they are particularly confused about how the sending-end and receiving-end voltages and currents are related in practical system analysis. As their	**10 Marks**	**L3**	**CO3**

		mentor and senior engineer, explain the significance of the ABCD constants and describe how these parameters mathematically relate the sending-end quantities to the receiving-end quantities. Illustrate your explanation with practical implications for a short transmission line, highlighting where and why ABCD parameters are used in real-world power system studies.			
	b.	A power utility wants to assess whether it can supply a 15,000-kW load at 0.8 lagging power factor using a 3-phase transmission line where each conductor has 1 Ω resistance per km. The receiving-end voltage is to be maintained at 132 kV, and the utility limits losses to 5% of transmitted power. As the load-flow and transmission planning engineer, estimate the maximum distance over which power can be delivered under the given limitations. Clearly justify your steps, calculations, and assumptions.	**10 Marks**	**L4**	**CO3**

15.	**a.**	A newly recruited batch of junior transmission engineers has been assigned to assist in the construction and safety assessment of a high-voltage overhead transmission line that passes across a wide water body. During the project briefing, they are required to understand both the physical components used in overhead construction and the mechanical behaviour of conductors under tension. As the senior engineer leading the project, explain to the trainees the major components involved in constructing an overhead transmission line, highlighting their functions and importance in ensuring mechanical stability and electrical safety.	**10 Marks**	**L2**	**CO4**
	b.	During the design review, the team evaluates a water-crossing span supported by two towers of heights 30 m and 90 m, placed 500 m apart shown in Fig.1. The conductor used has a tension of 1600 kg and a weight of 1.5 kg/m. Assuming the bases of both towers lie at water level, help the team determine: i. the minimum clearance of the conductor above the water, and ii. the clearance at the midpoint of the span. Use appropriate sag-tension principles to guide your calculations.	**10 Marks**	**L3**	**CO4**

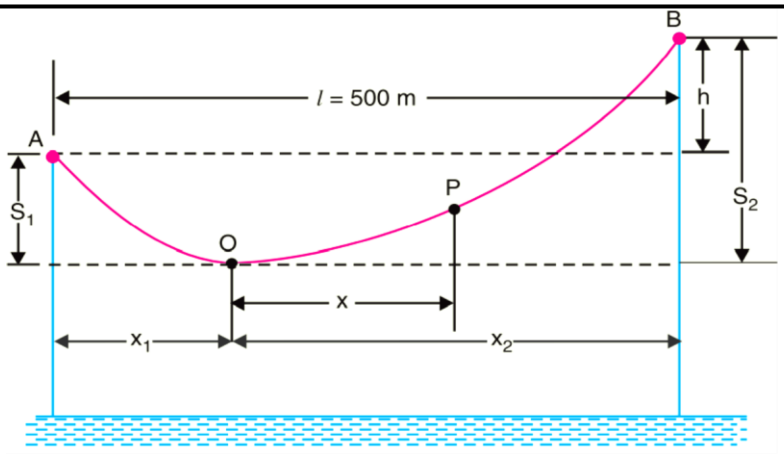

Fig. 1

Or

16.	**a.**	A utility company is investigating abnormal sound and visible glow occurring along a section of its overhead line network. The engineering task force must understand the underlying phenomenon and analyze the insulation performance. As part of the investigation, summarize the key factors that influence the occurrence of corona discharge in high-voltage overhead systems, helping the task force identify possible causes.	**10 Marks**	**L2**	**CO4**
	b.	For a 33 kV overhead line, an insulator string consists of three units. The capacitance between the pin of each insulator and earth is 11% of its self-capacitance. Help the task force determine: i. how the voltage distributes across the three insulators, and ii. the string efficiency under these conditions.	**10 Marks**	**L3**	**CO4**

17.	**a.**	A city's electricity department is upgrading its ageing distribution network to meet increasing consumer demand and to improve reliability. As part of the planning exercise, junior engineers must understand the principles of efficient distribution system design and perform voltage-drop analysis for DC distribution feeders. As a senior planning engineer, summarize the key requirements that make a distribution system efficient, so the junior engineers can evaluate the existing network and propose improvements.	**08 Marks**	**L2**	**CO5**
	b.	During the assessment of a DC distribution corridor, a 2-wire DC distributor AB of length 2 km supplies loads of 100 A, 150 A, 200 A, and 50 A located at 500 m, 1000 m, 1600 m, and 2000 m from the feeding point A. Each conductor of the distributor has a resistance of 0.01 Ω per 1000 m. If the voltage at point A is maintained at 300 V, assist the planning team in computing the potential difference at each load point, taking into account the cumulative voltage drops.	**12 Marks**	**L3**	**CO5**

Or

18.	**a.**	An urban transport authority is evaluating the performance of its electric tram system. Two trams operate on the same line and draw current through the trolley wire, with the return path provided through the tracks. Voltage drop in the feeder and track affects tram acceleration and passenger comfort. To help the technical team understand the electrical layout, explain the purpose and basic functions of a distribution system within an electrical network, using a simple schematic diagram relevant to traction or distribution supply.	**08 Marks**	**L2**	**CO5**
	b.	During field evaluation, two tram cars A and B are located 2 km and 6 km away from the substation. They return 40 A and 20 A respectively through the rails. The sub-station maintains a DC supply voltage of 600 V. The resistance of the trolley wire is 0.25 Ω/km and the track resistance is 0.03 Ω/km. Help the evaluation team calculate the voltage available across each tram car, considering both the supply and return path resistances.  Fig. 2	**12 Marks**	**L3**	**CO5**