



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fifth Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; February / March - 2022

Power Transmission and Distribution

Time: 3 hrs

Max. Marks: 100

Course Outcomes

The Students will be able to:

CO1: Recognize the structure and operation of electricity generation, transmission and distribution systems and its impact on the society and Environment.

CO2: Solve problems involving modeling, Mechanical and electrical design and performance evaluation of power transmission lines.

CO3: Calculate the capacitance and stress Levels To solve simple designing problems of single and three core underground cables.

CO4: Analyze the importance of overhead and underground transmission system.

Note: I) PART - A is compulsory. Two marks for each question.

II) PART - B: Answer any Two sub questions (from a, b, c) for Maximum of 18 marks from each unit.

Q. No.	Questions	Marks	BLs	COs	POs
I : PART - A		10			
I a.	What are the advantages of high voltage transmission?	2	L1	CO1	PO1
b.	Write a short note on suspension insulator.	2	L1	CO2	PO1
c.	Define the term mutual GMD.	2	L1	CO3	PO1
d.	Define efficiency and regulation of transmission lines.	2	L1	CO4	PO1
e.	Explain ring main distribution.	2	L1	CO5	PO1
II : PART - B		90			
UNIT - I		18			
1 a.	Discuss the effect of increase of transmission voltage on;				
	i) Volume of copper used	9	L2	CO1	PO1
	ii) Line loss and regulation				
	iii) Efficiency of transmission line				
b.	Deduce the expressions for Sag and tension, which are supported by the towers situated at equal level taking into account the wind and ice loadings.	9	L2	CO1	PO2
c.	An overhead transmission line at a river crossing is supported from two towers at heights of 50 m and 100 m above the water level. The horizontal distance between the towers being 400 m. If the maximum allowable tension is 1800 kg and the conductor weights 1 kg/m, find the clearance between the conductor and water at a point mid-way between the towers.	9	L3	CO1	PO2

UNIT - II**18**

- 2 a. Prove that the potential distribution across the string of insulators is not uniform (Consider four insulators in the string). 9 L2 CO2 PO2
- b. What is meant by grading of a cable? Explain the two methods of grading. 9 L2 CO2 PO2
- c. A 3-phase, 3-core, metal sheathed cable gave the following results on test for capacitance:
- I) Capacitance between two conductors bunched with the sheath and third conductor $0.5 \mu\text{F}/\text{km}$
- II) Capacitance between bunched conductors and sheath $0.825 \mu\text{F}/\text{km}$. Calculate the capacitance; 9 L3 CO2 PO3
- i) Between any two conductors
- ii) Between any two bunched conductors and the third conductor, if the sheath is insulated
- iii) Find the charging current/phase/km when it is connected to 20 kV, 50 Hz supply

UNIT - III**18**

- 3 a. Calculate the inductance of a 3ϕ lines with equilateral, symmetrical spacing. 9 L4 CO3 PO2
- b. Obtain an expression for the capacitance of a 3-phase unsymmetrically spaced transmission line. 9 L3 CO3 PO2
- c. Calculate the loop inductance/km of $1-\phi$ transmission line consisting of 2 parallel conductors 1.5 m apart and 1.5 cm in diameter. Calculate also the reactance of the transmission line if it is operating at a frequency of 50 Hz. 9 L3 CO3 PO3

UNIT - IV**18**

- 4 a. Derive an expression for ABCD constants of a medium transmission line using nominal T-method. Show that $AD - BC = 1$. 9 L4 CO4 PO2
- b. Define Ferranti effect. Obtain equivalent π circuit model of a long transmission line. 9 L4 CO4 PO2
- c. A 100 km long, 3-phase, 50 Hz transmission line has resistance/phase/km = 0.1Ω , reactance/phase/km = 0.5Ω , susceptance/phase/km = $10 \times 10^{-6} \text{ S}$. If the line supplies load of 20 MW at 0.9 pF lagging at 66 kV at the receiving end calculate; 9 L3 CO4 PO3
- i) Sending end power factor ii) Regulation
- iii) Transmission efficiency, assume a nominal π circuit for the line.

UNIT - V

18

- 5 a. List out any four advantages and disadvantages of corona. Explain the theory of corona formation. 9 L2 CO5 PO2
- b. What is distribution system? Write a short note on;
- i) Feeders
 - ii) Distributors 9 L2 CO5 PO2
 - iii) Service mains
 - iv) Radial distribution
- c. Find the critical disruptive voltage and the visual critical voltage for general and local corona on a 3-phase overhead transmission line, consisting of three stranded copper conductors spaced 2.5 m apart at the corners of an equilateral triangle. Air temperature and pressure are 21°C and 73.6 cm Hg respectively. The conductor dia irregularity factor and surface factors are 10.4 mm, 0.85, 0.7 and 0.8 respectively. 9 L3 CO5 PO3

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