CBCS SCHEME

USN

BEE402

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Transmission and Distribution

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	With the help of a neat diagram, explain the transmission and distribution system scheme indicating the standard voltages.	8	L2	CO1
	b.	Define string efficiency. List the methods of improving string efficiency.	4	L1	CO2
	c.	A transmission line has a span of 275 m between level supports. The conductor has an effective diameter of 1.96 cm and weighs 0.865 kg/m. Its ultimate strength is 8060 kg. If the conductor has ice coating of radial thickness 1.27 cm and is subjected to a wind pressure of 3.9 gm/cm^2 of projected area, calculate sag for a safety factor of 2. Weight of 1 C.C of ice is 0.91 gm.	8	L3	CO1
		OR			
Q.2	a.	Explain how increase in transmission voltage if a transmission line results in, (i) Reduced volume of conductor material. (ii) Increased transmission efficiency.	6	L2	CO1
	b.	Define sag and derive an expression for sag of a transmission line when supports are at the same level.	6	L2	CO1
	c.	Each line of a 3-phase system is suspended by a string of 3 similar insulators, if the voltage across the line unit is 17.5 KV, calculate the line-to-neutral voltage. Assume that the shunt capacitance between each insulator and earth is $\frac{1}{8}^{th}$ of the capacitance of the insulator itself. Also find the string efficiency.	8	L3	CO2
		Module – 2			
Q.3	a.	Derive an expression for the inductance of a conductor due to internal flux and external flux.	10	L2	CO3
	b.	In a single phase line as shown in Fig. Q3 (b), conductors a and a′ in parallel form one conductor and conductors b and b′ in parallel form the return path. Calculate the total inductance of the line per km assuming that current is equally shared by the two parallel conductors ; conductor diameter is 2 cm.  Fig. Q3 (b)	10	L3	CO3
		OR			
Q.4	a.	Define the terms self GMD and Mutual GMD.	4	L1	CO3
	b.	Derive the expression for line-to-neutral capacitance of a 3-phase overhead line when the conductors are symmetrically spaced.	10	L2	CO3
	c.	A single phase transmission line has two parallel conductors 3 meters apart, radius of each conductor being 1 cm. Calculate the capacitance of the line per km. Given $\varepsilon_0 = 8.854 \times 10^{-12}$ F/m.	6	L3	CO3

		Module – 3			
Q.5	a.	Explain how transmission lines are classified.	4	L1	CO4
	b.	Derive an expression for sending end voltage and sending end current of a medium transmission line employing nominal-T method. Draw the corresponding phasor diagram.	8	L2	CO4
	c.	A 1-phase overhead transmission line delivers 1100 kw at 33 kV at 0.8 power factor lagging. The total resistance and inductive reactance of the line are 10 Ω and 15 Ω respectively. Determine (i) Sending end voltage (ii) Sending end power factor (iii) transmission efficiency.	8	L3	CO4
		OR			
Q.6	a.	Derive expressions for ABCD constants of a long transmission line by rigorous method of analysis.	10	L2	CO4
	b.	A 100 km long, 3-phase 50 Hz transmission line has the following line constants : Resistance / phase / km = 0.1 Ω Reactance / phase / km = 0.5 Ω Susceptance / phase / km = $10 * 10^{-6}$ siemens. If the line supplies load of 20 MW at 0.9 pf lagging at 66 KV at the receiving end, calculate by nominal-π method, (i) Voltage regulation (ii) Transmission efficiency.	10	L3	CO4
		Module – 4			
Q.7	a.	What is Corona? Derive the expressions for disruptive critical voltage and visual critical voltage.	10	L2	CO5
	b.	Determine the critical disruptive voltage and visual critical voltage for a 3-phase 50 Hz, 132 KV line situated in a temperature of 30°C and at a barometric pressure of 74 cm. The conductor diameter is 1.5 cm while the equilateral spacing between the conductors is 2.75 m. The surface irregularity factor is 0.9 while $m_v = 0.75$	10	L3	CO5
		OR			
Q.8	a.	What is grading of cables? Why grading is needed? Explain capacitance grading of cables with diagram and necessary equations.	10	L2	CO5
	b.	A single core cable of diameter 2 cm and lead sheath of diameter 5.3 cm is to be used on a 66 KV, 3-phase system. Two intersheaths of diameter 3.1 cm and 4.2 cm are introduced between the core and the sheath. If the maximum stress in the layers is the same, determine the voltages on the intersheaths.	10	L3	CO5
		Module – 5			
Q.9	a.	What is power quality? Explain the various power quality problems.	8	L2	CO6
	b.	Explain bath tub curve with the help of a neat graph.	6	L2	CO6
	c.	What are the limitations of distribution system?	6	L1	CO6
		OR			
Q.10	a.	Explain Radial and Parallel distribution schemes.	10	L2	CO6
	b.	A 2-wire feeder ABC has load of 60 A at C and a load of 30 A at B both at 0.8 power factor lagging. The impedance of AB is (0.8 + j 0.16) ohm and that of BC is (0.16 + j 0.24) ohm. If the voltage at far end C is to be maintained at 400 V, determine the voltage at A and voltage at B.	10	L3	CO6

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