SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY
(AUTONOMOUS)

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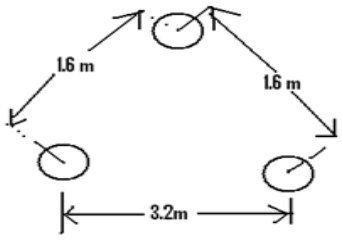
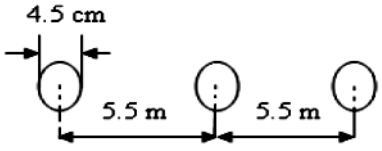
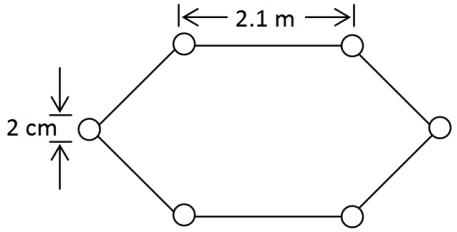
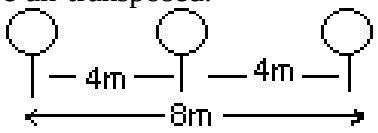
QUESTION BANK (DESCRIPTIVE)

Subject with Code : ELECTRICAL POWER TRANSMISSION SYSTEM (20EE0208)
Course & Branch: B. Tech -EEE
Year & Semester: II - B. Tech. & II-Semester **Regulation:**R20

UNIT –I

TRANSMISSION LINE PARAMETERS

1	a)	Explain the different types of conductors briefly.	[L2][CO1][6M]
	b)	Find the expression for the inductance of single-phase two-wire transmission lines.	[L3][CO1][6M]
2	a)	Explain the skin effect in transmission lines.	[L2][CO1][6M]
	b)	Determine the loop inductance per phase/ km of a single-phase, conductors are arranged 2m apart. The conductor diameter is 1.2cm.	[L2][CO1][6M]
3	a)	Derive the expression for the inductance of a three-phase symmetrical spacing transmission line.	[L3][CO1][6M]
	b)	Find the inductance per km of a three-phase transmission line using 1.24cm diameter conductors when these are placed at the corners of an equilateral triangle of each side 2m.	[L3][CO1][6M]
4	a)	What is the necessity of transposition in transmission lines?	[L1][CO1][6M]
	b)	Determine the inductance of a three-phase line operating at 50Hz and conductors are arranged as follows. The conductor diameter is 1cm.  fig	[L2][CO1][6M]
5	a)	Explain the concept of GMR and GMD in single and double circuit lines	[L2] [CO1] [6M]
	b)	Determine the inductance per km per phase of a single circuit 20kVline of the given configuration as shown in fig. The conductors are transposed and have a diameter of 4.5cm. 	[L3] [CO1] [6M]

6		Calculate the inductance of a 3-ϕ 100 km long double cut line shown in the figure with conductors of diameter 2.0 cm each, arranged at the corners at a hexogen with sides measuring 2.1m. 	[L4][CO1]12M]
7	a)	Derive the expression for the capacitance of a single-phase two-wire line.	[L3][CO1][6M]
	b)	A single-phase transmission line has two parallel conductors,3m apart, and the radius of each conductor is 1cm. Calculate the capacitance per km	[L4][CO1][6M]
8	a)	Derive an expression for the capacitance per phase for a 3-phase overhead transmission line when conductors are symmetrically placed.	[L3][CO1][6M]
	b)	Calculate the capacitance per phase of a three-phase transmission line as shown in the following fig. The radius of the conductor is 0.5cm. The lines are un-transposed. 	[L4][CO1][6M]
9	a)	When conductors are unsymmetrically placed, derive an expression for the capacitance per phase for a 3-phase overhead transmission line.	[L3][CO1][6M]
	b)	A three-phase overhead transmission line has its conductors arranged at the corners of an equilateral triangle of 2m sides. calculate the capacitance of each line conductor per km and the diameter of each conductor is 1.25 cm.	[L4][CO1][6M]
10		Explain the internal and external flux linkages of a single current-carrying conductor.	[L2][CO1][12M]

UNIT –II

PERFORMANCE OF SHORT, MEDIUM, AND LONG TRANSMISSION LINES

1	a)	Explain the different types of transmission lines	[L2][CO2][6M]
	b)	Derive the sending voltage and % voltage regulation in short transmission lines with a neat phasor diagram.	[L3][CO2][6M]
2	a)	Derive the equations for sending voltage and the current using the nominal T method with a neat phasor diagram.	[L3][CO2][6M]
	b)	Derive the ABCD constants of the medium transmission line by using the g nominal-T method.	[L3][CO2][6M]
3	a)	Derive the equations for sending voltage and the current using the nominal-Π method with a neat a phasor diagram.	[L3][CO2][6M]
	b)	Derive the ABCD constants of the medium transmission line by using the nominal- Π method.	[L3][CO2][6M]
4		A 100 km long, 3-phase, 50 Hz transmission line has following line constants: Resistance/ph/km=0.1ohm, Reactance/ph/km=0.5ohm, susceptance /ph/km=10×10e-6S.If the line supplies a load of 20 MW at 0.9 p.f lagging at 66 kV at the receiving end. Calculate (i) Sending end power factor (ii) % regulation (iii) Transmission efficiency by using the nominal T Method.	[L4][CO2][12M]
5		An overhead 3-phase transmission line delivers 400 KW at 11KV at 0.8 pf lagging. The resistance and reactance conductors are 1.5Ω and 4Ω per phase respectively. Determine (i) The sending end voltage and power factor (ii) percentage regulation (iii) Transmission efficiency.	[L2][CO2][6M]
6		Evaluate the generalized circuit constants for (i) Short transmission line (ii) Medium line nominal T method (iii) Medium line nominal Π method.	[L4][CO2][6M]
7		Derive expressions for sending end voltage and current for a long transmission line using a rigorous method.	[L3][CO2][12M]
8		A 3-phase transmission line 200 km long has the following constants. Resistance /phase /km = 0.16 Ω, reactance /phase /km= 0.25 Ω, shunt admittance /phase/km=1.5 ×10e-6 S. Calculate by rigorous method. The V_s and I_s when the line is delivering a load of 20 MW at 0.8 pf lagging. The V_r is kept constant at 110V.	[L4][CO2][12M]
9	a)	Prove the relation AD-BC=1 by considering a two-terminal pair network for the nominal T-method.	[L5][CO2][6M]
	b)	Explain the Ferranti effect in transmission lines.	[L2][CO2][6M]
10	(a)	Write short notes on transmission lines' proximity effect and surge impedance loading.	[L5][CO3][6M]
	(b)	Explain the transmission efficiency and % regulation in the transmission line.	[L2][CO2][6M]

UNIT –III

OVERHEAD INSULATORS AND CORONA

1		Explain various types of insulators with neat diagrams	[L2][CO3][12M]
2	a)	Explain the potential distribution over a string of suspension insulator string.	[L2][CO3][6M]
	b)	A three-phase overhead line is suspended by a suspension type insulator, which consists of three units. The potential across the top unit and middle unit are 12kV and 18kV respectively. Calculate: (i) the ratio of capacitance between pin and earth to the self-capacitance of each unit (ii) Line voltage and (iii) string efficiency	[L4][CO3][6M]
3	a)	What is string efficiency? Explain any two methods for improving string efficiency.	[L1][CO3][6M]
	b)	What are the causes of insulation failure?	[L1][CO3][6M]
4	a)	Each line of the three-phase system is suspended by a string of 3 insulators. If the voltage across the top unit is 17.5kV, calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is$1/8^{th}$ of the capacitance of the insulator itself. Also, find the string efficiency.	[L3][CO3][6M]
	b)	What do you understand by static shielding of insulators?	[L1][CO3] [6M]
5		What are the factors affecting corona? And derive the expressions for critical disruptive and visual critical voltage.	[L4][CO4][12M]
6	a)	What is corona? Explain the formation of corona briefly.	[L1][CO4][5M]
	b)	Determine the corona of a 3-phase line 160km long, conductor diameter 1.036cm, 2.44m delta spacing, air temperature 26.67oC, altitude 2440m, corresponding to an approximate barometric pressure of 73.15cm of Mercury, operating voltage 110kv at 50Hz. Assume data if required. (Irregularity factor etc.)	[L3][CO4][7M]
7	a)	What are the methods of reducing the corona effect?	[L4][CO4][12M]
	b)	A 132kV line with a 1.956cm diameter of the conductor is built so that corona takes place if the line voltage exceeds 210 kV (rms). If the value of the potential gradient at which the ionization occurs can be taken as 30kv per cm. Find the spacing between conductors.	[L2][CO4][6M]
8	a)	What are the advantages and disadvantages of corona?	[L2][CO4][6M]
	b)	A 3-phase, 220kV, 50Hz transmission line consisting of a 1.5 cm radius conductor spaced 2m apart in an equilateral triangular formation. If the temperature is 40^{O}c and atmospheric pressure is 76 cm .Calculate the corona loss per km of the line. Take m_a=0.85.	[L3][CO4][6M]
9	a)	Write a short note on capacitance grading.	[L3][CO3][6M]
	b)	A certain 3-phase equilateral transmission line has a total corona loss of 53KW, 106kV, and a loss of 98KW at 110.9kV what is disruptive critical voltage? What is corona's loss at 113kV?	[L2][CO4][6M]
10		The self-capacitance of each unit in a string of 3 suspension insulators is C, the shunt capacitance of the connecting metal work of each insulator to earth is 0.15 C while for a line is 0.1C. Calculate the voltage across each insulator as a percentage of the line voltage to earth and string efficiency.	[L4][CO3][12M]

UNIT-IV

MECHANICAL DESIGN OF TRANSMISSION LINES

1	a)	Derive the expression for sag for equal supports.	[L3][CO5][6M]
	b)	A 132 kV transmission line has the following data: weight of conductor =680kg/km; length of span = 260m; ultimate strength =3100kg, safety factor=2, calculate height above the ground at which the conductor should be supported. Ground clearance is 10 meters.	[L4][CO5][6M]
2	a)	Write a short note on the effect of wind and ice loading on the calculation of sag.	[L3][CO5][6M]
	b)	A transmission line has a span of 150m between level supports. The conductor has a cross-sectional area of 2 cm^2 the tension in the conductor is 2000kg. If the specific gravity of the conductor material is 9.9 gm/cm^3 and wind pressure is 1.5kg/m in length. Calculate the sag what is vertical?	[L4][CO5][6M]
3		Define sag and Derive the expression for sag and tension when the supports are at unequal heights.	[L3][CO5][12M]
4	a)	Draw and explain the stringing chart.	[L1][CO5][4M]
	b)	An overhead transmission line at a river crossing is supported by two towers at heights of 40m and 90 m above water level. The horizontal distance between the towers is 400m. If the allowable tension is 2000kg, find the clearance between the conductor and water at a point mid-way between the towers' height of the conductor is 1kg/m.	[L4][CO5][8M]
5	a)	Explain about sag template.	[L2][CO5][4M]
	b)	A transmission line has a span of 200 meters between level supports. The conductor has a cross-sectional area of 1.29 cm^2, weighs 1170kg/km, and has breaking stress of 4218 kg/cm^2.calculate the sag for a safety factor of 5, allowing a wind pressure of 122 kg per square meter of a projected area. What is the vertical sag?	[L4][CO5][8M]
6		A transmission line has a span of 275m between level supports. The conductor has an effective diameter of 1.96cm and weighs 0.865 kg/m. its ultimate strength is 8060 kg. If the conductor has an ice coating of the radial thickness of 1.27 cm and is subjected to a wind pressure of 3.9 gm. $/cm^2$ of the projected area, calculate sag for a safety factor of 2. The weight of 1 c.c of ice is 0.91 gm.	[L4][CO5][12M]
7		The transmission line has a span of 214 meters between level supports. Conductors have a cross-sectional area of 3.225cm^2 calculate the factor of safety under the following conditions. Vertical sag is 2.35m, the wind pressure is 1.5 kg/m run, breaking stress is 2540 kg/cm^2 weight of the conductor is 1.125 kg/m run.	[L4][CO5][12M]
8		An overhead transmission line has a span of 150m between level supports. The conductor has a cross-sectional area of 2 cm^2. The ultimate strength is 5000 kg/cm^2 and the safety factor is 5. The specific gravity of the material is 8.9 gm/cc. wind pressure is 1.5 kg/m. calculate the height of the conductor above the ground level at which it should be supported if a minimum clearance of 7m is to be left between the ground and conductor.	[L4][CO5][12M]
9		The towers of heights 3 m and 90 m, support a transmission line conductor at a water crossing. The horizontal distance between the towers is 500 m. If the tension in the conductor is 1600 kg. Find the minimum clearance of conductor and water clearance mid-way	[L4][CO5][12M]

		between the supports. The weight of the conductor is 1.5 kg/m. bases of the towers can be considered to be at water level.	
10	a)	Mention the applications of the sag template.	[L1][CO5][6M]
	b)	An overhead transmission line conductor having a parabolic configuration weighs 1.925 kg per meter of length. The area of the cross-section of the conductor is 2.2m cm^2 and the ultimate strength is 8000 kg/cm^2. The supports are 600 m apart having a 15m difference in levels. Calculate sag from the taller of the two supports which must be allowed so that the factor safety shall be 5. Assume that the ice load is 1 kg per meter run and there is no wind pressure.	[L4][CO5][8M]

UNIT-V

UNDERGROUND CABLES

1	a)	Derive the expression for Insulation resistance of a cable.	[L3][CO6][6M]
	b)	Obtain the expression for the capacitance of a single core cable.	[L3][CO6][6M]
2		Write short notes on (i) inter sheath grading and (ii) capacitance grading	[L4][CO6][12M]
3	a)	What are the limitations of belted cable? How these are can be overcome in pressurized cables?	[L1][CO6][6M]
	b)	A33KV single core cable has a conductor diameter of 10 mm and a sheath of the inside diameter of 40mm. find the maximum and minimum stress in the insulation.	[L3][CO6][6M]
4	a)	Distinguish between Underground cables and overhead lines.	[L3][CO6][6M]
	b)	Explain the pressure cables with a neat sketch.	[L3][CO6][6M]
5		Derive an expression for maximum stress and minimum stress in a single core cable.	[L3][CO6][12M]
6	a)	List the advantages and disadvantages of underground cables	[L3][CO6][6M]
	b)	Calculate the capacitance and charging current of a single core cable used on a 3-phase, 66kV system. The cable is 1 km long having a core diameter of 10 cm and an impregnated paper insulation of thickness of 7 cm. the relative permittivity of insulation may be taken as 4 and the supply at 50Hz.	[L4][CO6][6M]
7	a)	What is the necessity of grading cables? Explain the various grading methods of cables.	[L1][CO6][8M]
	b)	What are the limitations of solid types of cables?	[L1][CO6][4M]
8		Explain the classification of cables.	[L2][CO6][12M]
9		Explain the construction of underground cables	[L2][CO6][12M]
10		What is a cable? Explain the types of insulating materials used in cables.	[L1][CO6][12M]

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