SIDDARTH INSTITUTE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

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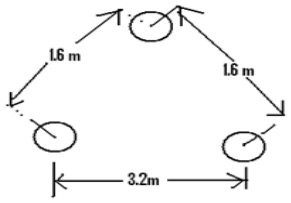
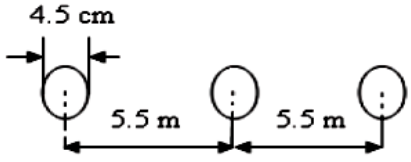
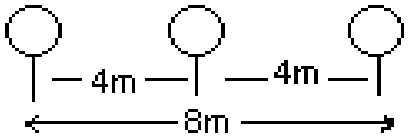
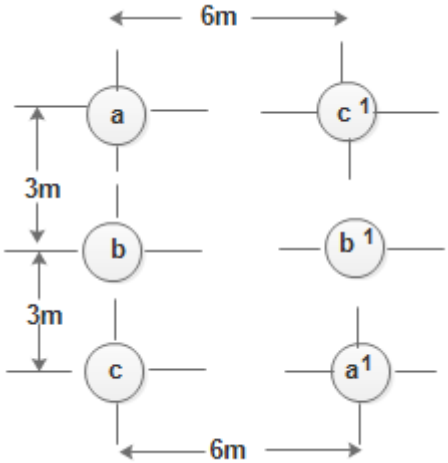
QUESTION BANK (DESCRIPTIVE)

Subject with Code : POWER SYSTEM –II (23EE0219)
Course & Branch: B. Tech -EEE
Year & Semester: III - B. Tech. & I-Semester **Regulation:**R23

UNIT –I

TRANSMISSION LINE PARAMETERS

1	a)	Explain the different types of conductors.	[L2][CO1][5M]
	b)	Find the expression for the inductance of single-phase two-wire transmission lines.	[L3][CO1][5M]
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][4M]
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][4M]
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][4M]
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] [4M]
6	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][4M]
7	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 km of a three-phase transmission line as shown in the following figure. The radius of the conductor is 0.5cm. The lines are un-transposed. 	[L3][CO1][4M]
8		When conductors are unsymmetrically placed, derive an expression for the capacitance per phase for a 3-phase overhead transmission line.	[L3][CO1][10M]
9		Figure shows the spacing of a double circuit 3-phase overhead line. The phase sequence is ABC and the line is completely transposed. The conductor radius in 1·3 cm. Find the inductance per phase per kilometre. 	[L3][CO1][10M]
10	a)	What is formula for resistance for solid conductors?	[L1][CO1][2M]
	b)	Explain the advantages of bundled conductors in a transmission lines.	[L2][CO1][2M]
	c)	What is proximity effect in the transmission line?	[L1][CO1][2M]
	d)	Discuss the equivalent circuit diagram of a transmission line.	[L2][CO1][2M]
	e)	What is the formula for effect of ground on capacitance of single conductor?	[L1][CO1][2M]

UNIT –II

PERFORMANCE OF TRANSMISSION LINES

1	a)	Derive the sending voltage and % voltage regulation in short transmission lines with a neat phasor diagram.	[L3][CO2][5M]
	b)	A single phase overhead transmission line delivers 1100 kW at 33 kV at 0·8 p.f. 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 and (iii) transmission efficiency.	[L3][CO2][5M]
2	a)	Derive the equations for sending voltage and sending current using the nominal T method with a neat phasor diagram.	[L3][CO2][5M]
	b)	Derive the ABCD constants of the medium transmission line by using the nominal-T method.	[L3][CO2][5M]
3	a)	Derive the equations for sending voltage and sending current using the Nominal-Π method with a neat phasor diagram.	[L3][CO2][5M]
	b)	Derive the ABCD constants of the medium transmission line by using the nominal-π method.	[L3][CO2][5M]
4		A 3-phase, 50-Hz overhead transmission line 100 km long has the following constants : Resistance/km/phase = 0.1 Ω, Inductive reactance/km/phase = 0·2 Ω, Capacitive susceptance/km/phase = $0{\cdot}04 \times 10^{-4}$ siemen, Determine (i) the sending end current (ii) sending end voltage (iii) sending end power factor and (iv) transmission efficiency when supplying a balanced load of 10,000 kW at 66 kV, p.f. 0·8 lagging. Use nominal T method.	[L3][CO2][10M]
5		A 100-km long, 3-phase, 50-Hz transmission line has following line constants: Resistance/phase/km = 0·1Ω, Reactance/phase/km = 0·5 Ω. Susceptance/phase/km = 10×10^{-6} S. If the line supplies load of 20 MW at 0·9 p.f. lagging at 66 kV at the receiving end, calculate by nominal π method : (i) sending end power factor (ii) regulation (iii) transmission efficiency	[L4][CO2][10M]
6		A balanced 3-phase load of 30 MW is supplied at 132 kV, 50 Hz and 0·85 p.f. lagging by means of a transmission line. The series impedance of a single conductor is (20 + j52) ohms and the total phase-neutral admittance is 315×10^{-6} Siemen. Using nominal T method, determine: (i) the A, B, C and D constants of the line (ii) sending end voltage (iii) regulation of the line.	[L3][CO2][10M]
7		Derive expressions for sending end voltage and current for a long transmission line using a rigorous method.	[L3][CO2][10M]
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=1.5×10^{-6} S. Calculate by rigorous method. The Vs and Is when the line is delivering a load of 20 MW at 0·8 p.f. lagging The receiving end voltage is kept constant at 110 kV.	[L4][CO2][10M]
9	a)	Prove the relation AD-BC=1 by using Long line a rigorous method.	[L5][CO2][5M]
	b)	Explain the Ferranti effect in transmission lines.	[L2][CO2][5M]
10	a)	Explain the different types of transmission lines.	[L2][CO2][2M]
	b)	Define voltage regulation of transmission line.	[L1][CO2][2M]
	c)	What is surge impedance?	[L1][CO2][2M]
	d)	Define the expression for characteristic impedance and the propagation constant.	[L1][CO2][2M]
	e)	Explain the effect of charging current in transmission lines?	[L2][CO2][2M]

UNIT –III
OVERHEAD LINE INSULATORS

1		Explain various types of insulators with neat diagrams	[L2][CO3][10M]
2		Explain the potential distribution over a string of suspension insulator string.	[L2][CO3][10M]
3		What is string efficiency? Explain any two methods for improving string efficiency.	[L1][CO3][10M]
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][5M]
	b)	What do you understand by static shielding of insulators?	[L1][CO3] [5M]
5	a)	What are the causes of insulation failure?	[L1][CO3][5M]
	b)	In a 33 kV overhead line, there are three units in the string of insulators. If the capacitance between each insulator pin and earth is 11% of self-capacitance of each insulator, find (i) the distribution of voltage over 3 insulators and (ii) string efficiency	[L3][CO3][5M]
6	a)	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][5M]
	b)	Explain the mathematical expression for string efficiency for 3 disc suspension insulator.	[L2][CO3][5M]
7		An insulator string consists of three units, each having a safe working voltage of 15 kV. The ratio of self-capacitance to shunt capacitance of each unit is 8: 1. Find the maximum safe working voltage of the string. Also find the string efficiency.	[L3][CO3][10M]
8		Each line of a 3-phase system is suspended by a string of 3 identical insulators of self-capacitance C farad. The shunt capacitance of connecting metal work of each insulator is 0·2 C to earth and 0·1 C to line. Calculate the string efficiency of the system if a guard ring increases the capacitance to the line of metal work of the lowest insulator to 0·3 C.	[L4][CO3][10M]
9	a)	What are the desirable properties of insulators?	[L1][CO3][4M]
	b)	The three bus-bar conductors in an outdoor substation are supported by units of post type insulators. Each unit consists of a stack of 3 pin type insulators fixed one on the top of the other. The voltage across the lowest insulator is 13·1 kV and that across the next unit is 11 kV. Find the bus-bar voltage of the station.	[L3][CO3][6M]
10	a)	What are the insulating materials used in insulators.	[L1][CO3][2M]
	b)	What are the advantages of suspension type insulator?	[L1][CO3][2M]
	c)	What is the function of insulators?	[L1][CO3][2M]
	d)	What is mean by self or mutual capacitance?	[L1][CO3][2M]
	e)	Define safety factor of insulator?	[L1][CO2][2M]

UNIT-IV

SAG AND TENSION

1	a)	Derive the expression for sag for equal supports.	[L3][CO4][5M]
	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][CO4][5M]
2	a)	Write a short note on the effect of wind and ice loading on the calculation of sag.	[L3][CO4][5M]
	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 and what is vertical?	[L4][CO4][5M]
3		Derive the expression for sag and tension when the supports are at unequal heights.	[L3][CO4][10M]
4	a)	Draw and explain the stringing chart.	[L1][CO4][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.	[L3][CO4][6M]
5	a)	Explain about sag template.	[L2][CO4][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][CO4][6M]
6		What are the factors affecting corona? And derive the expressions for critical disruptive and visual critical voltage.	[L1][CO5][10M]
7	a)	What is corona? Explain the formation of corona briefly.	[L1][CO5][5M]
	b)	A 3-phase, 220 kV, 50 Hz transmission line consists of 1·5 cm radius conductor spaced 2 metres apart in equilateral triangular formation. If the temperature is 40ºC and atmos- pheric pressure is 76 cm, calculate the corona loss per km of the line. Take mo = 0·85.	[L4][CO5][5M]
8	a)	What are the methods of reducing the corona effect?	[L1][CO5][4M]
	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][CO5][6M]
9	a)	What are the advantages and disadvantages of corona?	[L1][CO5][5M]
	b)	A 132 kV line with 1·956 cm dia. conductors is built so that corona takes place if the line voltage exceeds 210 kV (r.m.s.). If the value of potential gradient at which ionization occurs can be taken as 30 kV per cm, find the spacing between the conductors.	[L3][CO5][5M]
10	a)	Give two factors which affect the sag in transmission line.	[L2][CO4][2M]
	b)	Define sag?	[L1][CO4][2M]
	c)	What is the effect of wind and ice loading on sag	[L1][CO4][2M]
	d)	What is mean by corona effect?	[L1][CO5][2M]
	e)	Define radio interference due corona.	[L1][CO5][2M]

UNIT-V

Voltage Control and Power Factor Improvement

1		Explain with a neat sketch : i. Booster transformers ii. Induction regulators	[L2][CO6][10M]
2		Explain with a neat sketch : i. On-load tap-changing transformer ii. Auto-transformer tap-changing	[L2][CO6][10M]
3		A load of 10,000 kW at a power factor of 0·8 lagging is supplied by a 3-phase line whose voltage has to be maintained at 33kV at each end. If the line resistance and reactance per phase are 5 Ω and 10 Ω respectively, calculate the capacity of the synchronous condenser to be installed for the purpose. Comment on the result.	[L3][CO6][10M]
4	a)	Explain the causes of low power factor of the supply system	[L2][CO6][4M]
	b)	Discuss the disadvantages of a low power factor.	[L2][CO6][6M]
5		Explain the effect of shunt and series capacitors with neat phasor diagrams.	[L2][CO6][10M]
6		Explain any two methods of power factor improvement?	[L2][CO6][10M]
7	a)	A single phase motor connected to 400 V, 50 Hz supply takes 31·7A at a power factor of 0·7 lagging. Calculate the capacitance required in parallel with the motor to raise the power factor to 0·9 lagging.	[L3][CO6][10M]
8	a)	Explain the concept of load compensation in power systems.	[L2][CO6][5M]
	b)	Derive the laudability characteristics of overhead transmission lines	[L3][CO6][5M]
9	a)	Explain with neat sketch, explain the performance of an uncompensated transmission line.	[L2][CO6][5M]
	b)	Discuss the behavior of a radial line with asynchronous load.	[L2][CO6][5M]
10	a)	Explain the importance of voltage control?	[L2][CO6][2M]
	b)	Explain the methods of voltage control.	[L2][CO6][2M]
	c)	Explain two advantages of power factor improvement.	[L2][CO6][2M]
	d)	What is a symmetrical transmission line?	[L1][CO6][2M]
	e)	What is asynchronous load in a transmission system?	[L1][CO6][2M]

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