SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech III Year I Semester Supplementary Examinations December-2021
ELECTRICAL POWER TRANSMISSION SYSTEMS
(Electrical and Electronics Engineering)

Time: 3 hours   Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

UNIT-I

1	a	Derive the expression for the capacitance of a three phase double circuit hexagonal spacing configuration.	L2	6M
	b	A 1-phase line constructed 13.5m above ground has spacing between the conductors 3.9m. The radius of the conductor is 1.78cm .Determine the capacitance of the line per length, considering the effect of earth and neglecting it.	L2	6M

OR

2	a	Derive the expression for capacitance of a single phase two-wire line system.	L2	6M
	b	Calculate the Inductance and capacitance of a 100KM long 3- phase, 50Hz overhead transmission line consisting of 3 conductors, each of diameter 2cm and spaced 2.5m at the corners of an equilateral triangle.	L2	6M

UNIT-II

3	a	Derive the expression for A, B, C, D parameters for long transmission lines (rigorous method).	L2	6M
	b	A3-phase, 50Hz, 15km transmission line supplying a total load of 850kW at 0.8p.f lagging and 11kV has the following line constants: r=0.45ohms/km, x=0.6ohms/km. Calculate the line current, receiving end voltage, voltage regulation and efficiency of transmission.	L2	6M

OR

4	a	Explain the terms efficiency and regulation in relation to transmission lines.	L2	6M
	b	An over head 3-phase transmission line delivers 5000kW at 22kV at 0.8p.f lagging. The resistance and reactance of each conductor is 4ohms & 6ohms respectively. Determine: (i). Sending end voltage, (ii). Regulation, (iii). Efficiency.	L2	6M

UNIT-III

5	a	Explain various types of insulators with neat diagrams and compare them?	L2	6M
	b	Determine the corona characteristics of a 3-phase line 160km long, conductor diameter 1.036cm, 2.44m delta spacing, air temperature 26.67°C, 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.)	L2	6M

OR

6	a	Derive the expression for sag and tension when the supports are at unequal heights.	L2	6M
	b	A three phase overhead line is suspended by a suspension type insulator, which Consists of three units. The potential across top unit and middle unit are 12 kv and 18 kv Respectively. Calculate: (i). the ratio of capacitance between pin and earth to the self Capacitance of each unit, (ii). The line voltage and (iii). String efficiency.	L2	6M

UNIT-IV

7 a A surge of 220kV travelling in a line of natural impedance 500Ω arrives at a junction with two lines of impedances 700Ω and 400Ω respectively. Find the surge voltages and currents transmitted into each branch line. Also find the reflected surge voltage and current.   L2   6M

   b A cable with a surge impedance of 100 ohms is terminated in two parallel-connected, open-wire lines having surge impedance of 600 and 1000 ohms respectively. If a steep fronted voltage wave of 1000V travels along the cable, find from the first principles the voltage and current in the cable and the open-wire lines immediately after the travelling wave has reached the transition point. The line may be assumed to be of infinite length.   L2   6M

OR

8 a Discuss the phenomenon of reflection and refraction in travelling waves. Derive the expressions for reflection and refraction coefficients when a travelling wave is terminated through a resistance.   L2   6M

   b A surge of 15KV magnitude travels along a cable towards its junction with an overhead line. The inductance and capacitance of the cable and overhead line are respectively 0.3mH, 0.4μF and 1.5 mH, 0.012μF per Km. find the voltage rise at the junction due to the surge. And derive the formula used.   L2   6M

UNIT-V

9 a Distinguish between Underground cables and overhead lines.   L2   6M

   b Show that in a three core belted cable the neutral capacitance to earth conductor C_n is equal to $C_s + 3C_c$ where C_s and C_c are capacitances of each conductor to sheath and to each other respectively.   L2   6M

OR

10 a Derive a relation between the conductor radius and inside sheath radius of a single core cable so that the electric stress of the conductor surface may be minimum.   L2   6M

    b A cable has been insulated with two insulating materials having permittivity of 6 and 4 respectively. The inner and outer diameter of a cable is 3cms and 7cms. If the dielectric stress is 50kV/cm and 30kV/cm, calculate the radial thickness of each insulating layer and the safe working voltage of the cable.   L2   6M

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