Q.P. Code: 16EE218 **R16**

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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year I Semester Supplementary Examinations November-2020

ELECTRICAL POWER TRANSMISSION SYSTEMS

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 60

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

UNIT-I

1	**a**	Derive an expression for the capacitance per phase for a 3-phase overhead transmission line when conductors are symmetrically placed.	**6M**
	b	A 1-phase line constructed 13.5 m above ground has spacing between the conductors 3.9 m. The radius of the conductor is 1.78 cm. Determine the capacitance of the line per length, considering the effect of earth and neglecting it.	**6M**

OR

2	**a**	Derive the expression for the capacitance of a three phase double circuit hexagonal spacing configuration.	**6M**
	b	Determine the inductance/phase/km of a double circuit 3-phase line. The radius of each conductor is 20mm and the conductors are placed on the circumference of an imaginary circle at a distance of 7m forming a regular hexagonal.	**6M**

UNIT-II

3	**a**	Derive the expression for A, B, C, D parameters for long transmission lines (rigorous method).	**5M**
	b	An overhead 3-phase transmission line delivers 5000 kW at 22 kV at 0.8 p.f lagging. The resistance and reactance of each conductor is 4 ohms 6 ohms respectively. Determine: (i) Sending end voltage. (ii) Regulation. (iii) Efficiency.	**7M**

OR

4		A 100km long, 3-phase, 50Hz transmission line has following line constants: Resistance/ph/km = 0.1ohm, Reactance/ph/km = 0.2ohm, Susceptance/ph/km = $4*10^{-6}$ siemen. Determine (i) Sending end voltage and current (ii) Sending end power factor (iii) Transmission efficiency when supplying a balanced load of 10,000KW at 66KV at 0.8 p.f lagging. By using nominal T method.	**12M**

UNIT-III

5	**a**	Explain about the improvement of string efficiency by grading of units and guard ring.	**5M**
	b	An overhead line has a span of 150 m between level supports. The conductor has a cross sectional are of $2cm^2$. The ultimate strength is $5000kg/cm^2$ and safety factor is 5. The specific gravity of the material is $8.9gm/cm^3$. The wind pressure is 1.5kg/m. calculate the height of the conductor above the ground level at which it should be supported if a minimum clearance of 7 m is to be left between the ground and the conductor.	**7M**

OR

6	**a**	Derive the expression for sag and tension when the supports are at unequal heights	**6M**
	b	An overhead transmission line at a river crossing is supported from two towers at heights of 40m and 90 m above water level. The horizontal distance between the towers being 400m.If the allowable tension is 2000kg, find the clearance between the conductor and water at a point mid-way between the towers. Weight of conductor is 1kg/m.	**6M**

UNIT-IV

7		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 an Open circuited line, short circuited line and reactance.	**12M**

OR

8		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.	**12M**

UNIT-V

9	**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.	**5M**
	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.	**7M**

OR

10	**a**	Derive the Insulation resistance of a cable.	**6M**
	b	Derive the Capacitance of a single core cable.	**6M**

*** END ***