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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)

**B.Tech III Year I Semester Regular & Supplementary Examinations Nov/Dec 2019**

**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 the expression for capacitance of a single phase two-wire line system. 6M  
 b A single phase transmission line has two parallel conductors 3 m apart, the radius of each conductor being 1 cm. Calculate the loop inductance per km length of the line if the material of the conductor is: (i) Copper. (ii) Steel with relative permittivity of 100. 6M

**OR**

- 2 Derive an expression for the inductance per phase for a 3-phase overhead transmission line when conductors are symmetrically placed and unsymmetrically spaced. 12M

**UNIT-II**

- 3 a Explain the terms efficiency and regulation in relation to transmission lines 5M  
 b A 3-phase, 50 Hz, 15 km transmission line supplying a total load of 850 kW at 0.8 p.f lagging and 11 kV has the following line constants:  $r = 0.45$  ohms/km,  $x = 0.6$  ohms/km. Calculate the line current, receiving end voltage, voltage regulation and efficiency of transmission. 7M

**OR**

- 4 Write all equations for finding sending end voltage, current, power factor, power and regulation and transmission efficiency for (i) short transmission line (ii) medium line nominal T method (iii) medium line nominal  $\pi$  method. 12M

**UNIT-III**

- 5 a What are the factors affecting corona? And derive the expressions for critical disruptive and visual critical voltage. 5M  
 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.) 7M

**OR**

- 6 a Explain various types of insulators with neat diagrams and compare them? 5M  
 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. 7M

**UNIT-IV**

- 7 Derive the expression for transient current wave, show that transient current is sum of incident current, and reflected current. 12M

**OR**

- 8 A surge of a 200kv travelling on a line of natural impedance 500ohms arrives at a junction with two lines of impedances 700ohms and 300ohms respectively. Find the surge voltages and currents transmitted into each branch line. Also find the reflected 12M

surge voltage and current.

**UNIT-V**

- 9 a 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. **6M**
- b Show that the ratio of maximum potential gradient to the minimum potential gradient is  $R/r$ . Where  $r$  and  $R$  is the conductor radius and sheath radius. **6M**
- OR**
- 10 The maximum and minimum stresses in the dielectric of a single core cable are 40kv/cm (r.m.s) and 10kv/cm (r.m.s) respectively. If the conductor diameter is 1cm, find: (i) Thickness of insulation (ii) Operating voltage. **12M**

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