

Code No: 135BJ/125AG/115AG/55011

**R16/R15/R13/R09**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. Tech III Year I Semester Examinations, March - 2021**

**POWER SYSTEMS - II**

**(R16-Electrical and Electronics Engineering; R15-Electrical and Electronics Engineering;  
R13-Electrical and Electronics Engineering; R09-Electrical and Electronics Engineering)**

**Time: 3 hours**

**Max. Marks: 75**

**Answer any five questions  
All questions carry equal marks**

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- 1.a) Derive the expression for inductance of a 3-phase overhead transmission line when the conductors are symmetrically spaced.
- b) A three-phase overhead transmission line has its conductors arranged at the corners of an equilateral triangle of 2m side. Calculate the inductance of each line conductor per km. If the diameter of the conductor is 1.25 cm. [9+6]
- 2.a) Derive an expression for the capacitance per km of a single phase line taking into account the effect of ground.
- b) A conductor in a single phase transmission line are 6m above ground, each conductor has a diameter of 1.5 cm and the two conductors are spaced 3 m apart. Calculate the capacitance/km of the line (i) excluding ground effect (ii) including ground effect. [8+7]
- 3.a) Derive the expression for A, B, C, D parameters of nominal-T medium length transmission line.
- b) A 3- $\Phi$ , 50Hz, 25km long overhead line supplies 1.2MW at 11kV at 0.8 pf lagging. The line resistance and inductance are  $0.04\Omega$  and 0.8mH per phase per km. Determine regulation and Transmission efficiency of the line. [7+8]
4. A 3- $\Phi$ , 50Hz transmission line has the following parameters per km:  $R=0.2\Omega$ ,  $L=1.3mH$  and  $C=0.01\mu F$ . Determine regulation and the efficiency of the line if the line is 160km long and delivers 40MW at 132kV and 0.8 p.f lagging. [15]
- 5.a) What is the traveling wave? Explain the development of such a wave on an overhead line.
- b) A surge of 100kV traveling in a line of natural impedance 600ohms arrives at a junction with two lines of impedances 800ohms and 200ohms respectively. Find the surge voltages and currents transmitted into each branch line. Also find the reflected surge voltage and current. [9+6]
- 6.a) State and explain the factors that affect the corona loss.
- b) Determine the critical disruptive voltage and corona loss for a 3-phase line operating at 110kV which has conductor of 1.25 cm dia arranged in a 3.05 meter delta. Assume air density factor of 1.07 and the dielectric strength of air to be 21kV/cm. [7+8]
- 7.a) Discuss the methods for improving string efficiency of over head line insulators.
- b) In a three phase overhead system, each line is suspended by a string of three insulators. The voltage across top unit and middle unit are 10kV and 11kV respectively. Calculate the ratio of shunt capacitance to self capacitance, Line voltage and String efficiency. [8+7]
- 8.a) Derive the expression for insulation resistance of a single core cable.
- b) What is the necessity of grading of cables? Explain briefly the various grading methods of cables. [7+8]