

R13

Code No: 115AG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, March - 2017

POWER SYSTEMS-II

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

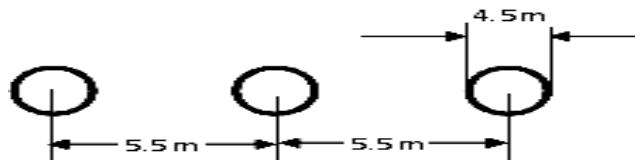
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A**(25 Marks)**

- 1.a) What is transposition? What are the advantages of it? [2]
- b) What are bundled conductors and mention its advantages? [3]
- c) What are ABCD constants in a transmission line? [2]
- d) List out the limitations of T and π methods? [3]
- e) What are the reflection and refraction coefficients of a short circuited line? [2]
- f) Explain clearly the "Ferranti effect" with a phasor diagram. [3]
- g) Classify the insulators based on the voltage. [2]
- h) Define string efficiency. What are the various methods to improve string efficiency? [3]
- i) State the properties of insulating materials for cable. [2]
- j) A single core cable has a conductor diameter of 1cm and the insulation thickness of 0.4 cm. If the specific resistance of insulation is $5.5 \times 10^{14} \Omega$ -cm, what will be the insulation resistance for a length of 3 km? [3]

PART - B**(50 Marks)**

- 2.a) Explain the concept of GMR and GMD.
- b) Determine inductance/km/phase of a single circuit 3-phase, 25 KV line given below: [5+5]

**OR**

- 3.a) Derive the expression for capacitance of an unsymmetrical three phase system regularly transposed.
- b) A 3-phase overhead transmission line has its conductors arranged at the corners of an equilateral triangle of 3m side. Calculate the capacitance of each line conductor per km. Given that diameter of each conductor is 1.25cm. [5+5]

- 4.a) A three phase, 50 Hz overhead transmission line has the following distributed constants per phase: Resistance = 30 ohm; Inductance reactance = 70 ohm, capacitive succetpance = 0.04 micro mho. If the load at the receiving end is 80 MVA at 0.8 p.f lagging with 132 kV between lines, calculate
- (i) Voltage (ii) Power factor at the receiving end
(iii) Regulation and (iv) Efficiency of transmission line.
- Use nominal T method.
- b) Derive equation which represents the performance of a long transmission line with its electrical parameters uniformly distributed along its length. [5+5]

OR

- 5.a) A 3-phase 50 Hz transmission line has resistance, inductance, and capacitance per phase of 15 ohm, 0.2 H and 0.10 μ F respectively and delivers a load of 45 MW at 132 kV and 0.8 pf lag. Determine the efficiency and regulation of the line using nominal- Π method.
- b) What is surge impedance and surge impedance loading of a transimission line? What is the physical significance of SIL? [5+5]
- 6.a) Using Bewley's Lattice diagram, represent the voltage and current waveforms of a short circuited line.
- b) In a three phase overhead line, each conductor have an overall diameter of 3.5 cm and are arranged in delta formation. Assuming a critical voltage of 275 kV between lines and an air density factor of 0.9. Find the minimum spacing between conductors allowable, assuming fair weather conditions and breakdown voltage of 21.21(rms) kV/cm for smooth conductors. [5+5]

OR

- 7.a) A surge of 220 KV traveling on a line of surge impedance 400 ohms reaches a junction of the line with two branch lines of surge impedance 600 and 500 ohms respectively. Find the surge voltage and current transmitted into each branch line. Also find the reflected surge voltage and current.
- b) Explain, how does skin and proximity effects on resistance of solid conductors. [5+5]
- 8.a) Explain why the potential distribution is not, in general, uniform over the string in a suspension type of insulators.
- b) For a overhead line span length is 180m, difference in levels of supports is 7m, conductor diameter 2cm, weight per unit length of conductor 2 kg and wind pressure of 45 kg/m² of projected area. If the maximum tensile strength of the conductor is 4500 kg/cm² and safety factor 5, calculate the sag. [5+5]

OR

- 9.a) What is a stringing chart? Explain its application.
- b) Each line of a three phase system is suspended by a string of 3 identical insulators of self capacitance C farad. The shunt capacitance of the connecting metal work of each insulator is 0.3C to earth and 0.2C to line. Calculate the string efficiency of the system if the guard ring increases the capacitance to the line of the metal work of the lowest insulator to 0.35C. [5+5]

- 10.a) Write a short note on single core cable with a neat diagram.
- b) The inner and outer diameter of a cable are 3.5cm and 9 cm respectively. The cable is insulated with two materials having permittivities of 6 and 4 respectively with corresponding stresses of 40 kV/cm and 30 kV/cm. Calculate the radial thickness of each insulator layer and safe working voltage of the cable. [5+5]

OR

- 11.a) What do you mean by grading of cable? Explain capacitance grading of cable.
- b) A single core 11 kV, 50Hz, 6 km long cable has a core diameter of 2.2 cm and diameter of under sheath 3.0 cm. The relative permittivity of the insulating material is 3. The power factor on open circuit is 0.04. Determine
- The capacitance of the cable
 - Charging per conductor
 - Dielectric loss
 - The equivalent insulation resistance. [5+5]

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