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# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech V Semester End Examinations(Regular) - November, 2019

Regulation: IARE – R16

## TRANSMISSION AND DISTRIBUTION SYSTEMS

**Time: 3 Hours**

**(EEE)**

**Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

### UNIT – I

1. (a) Derive an expression for inductance of three-phase lines with symmetrical spacing? [7M]
- (b) Determine the inductance of a 3-phase line, operating at 50 Hz and the conductors are arranged as shown in Figure 1. The conductor diameter is 0.7 cm. [7M]

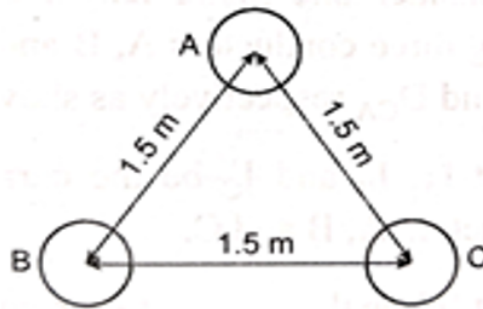


Figure 1

2. (a) Describe the phenomenon of corona? How can the corona loss are minimized in transmission lines. [7M]
- (b) Find the capacitance per km of a single-phase overhead line consisting of two conductors each 4.4755 cm diameter. The spacing is 3m? [7M]

### UNIT – II

3. (a) Explain the nominal –  $\pi$  model of medium transmission line with a neat circuit diagram and a phasor diagram? [7M]
- (b) A balanced 3 phase load of 30 MW is supplied at 132 kV, 50 Hz and 0.85 P.F. lagging by means of transmission line. These series impedance of a single conductor is  $(20+j52)$  ohms and the total phase- neutral admittance is  $315 \times 10^{-6}$  mho. Using nominal T method, determine
  - i) The A, B, C, and D constants of the line
  - ii) Sending end voltage
  - iii) Regulation of the line
 [7M]

4. (a) Discuss the action of a synchronous phase modifiers for voltage regulation of a line and explain carefully how its use increases the current carrying capacity of a transmission line. [7M]
- (b) A 3-phase transmission line 200 Km long has the following constants: Resistance/ph/km =  $0.31\Omega$ , Reactance/ph/km =  $0.48\Omega$ , and shunt admittance/ph/km =  $3 \times 10^{-6}$  S. Calculate by rigorous method the sending end voltage and current when the line is delivering a load of 21.3 MW at 0.85 pf lagging. The receiving end current is maintained at 129 A. [7M]

### UNIT – III

5. (a) Explain in detail with the diagram
- i) Pin insulators
  - ii) Suspension insulators
  - iii) Strain insulators [7M]
- (b) An insulator string consists of three units, insulator nearest to the line having a safe voltage of 20 kV. The ratio of self to shunt capacitance is 6:1. Determine the line voltage and string efficiency. [7M]
6. (a) Explain briefly about the construction of cable with neat diagram. [7M]
- (b) A 33 kV single core cable has a conductor diameter of 1 cm and a sheath of inside diameter 4 cm. Find the maximum and minimum stress in the insulation. [7M]

### UNIT – IV

7. (a) Relate sag with weight of the conductor when the power conductor is strung between two supports at equal height. [7M]
- (b) An overhead transmission line at a river crossing is supported from two towers at heights of 45 m and 95 m above water level, the horizontal distance between the towers being 450 m. If the maximum allowable tension is 1995 kg, find the clearance between the conductor and water at a point mid-way between the towers. Weight of conductor is 1.1 kg/m. [7M]
8. (a) Explain the effect of wind and ice loading of a transmission line conductor. [7M]
- (b) Calculate maximum sag(total and vertical) of a line with the copper conductor 7/0.295 cm size, area 0.484 sq.cm . Overall dia.0.889 cm, weight 428 kg/km and breaking strength 1093 kg. Assume factor of safety 2,. Span 200 meters, level supports-
- i) Due to weight of the conductor
  - ii) Due to additional weight of ice loading of 1 cm thickness
  - iii) Due to both (i) and (ii) plus wind acting horizontally at a pressure of 39 Kg per sq metre. [7M]

### UNIT – V

9. (a) Comparison of DC distribution and AC Distribution [7M]
- (b) A two wire distributor is 300 m long, the loop resistance is  $0.064 \Omega$  the wire is uniformly loaded with 3 A/m. calculate i) point of minimum potential and value of this potential when distributor fed from A ii) current supplied by end A and B. [7M]
10. (a) Give classification of distribution system. Explain the design considerations in distribution system. [7M]
- (b) A electric train taking a constant current of 600A moves on a section of line between two substations 8km apart and maintained at 575 and 590v respectively. The track resistance is  $0.04\Omega/\text{km}$  both go and return. Find the point of minimum potential along the track and current supplied by two substations at that instant. [7M]