USN ⟨☐☐☐☐☐☐☐☐☐☐⟩   15EE43

Fourth Semester B.E. Degree Examination, June/July 2017
Transmission and Distribution

Time: 3 hrs.   Max. Marks: 80

Note: Answer any FIVE full questions, choosing
ONE full question from each module.

Module-1

1   a. With a neat diagram, explain feeders, distributor and service main of a distribution system.
        (06 Marks)
    b. A transmission line conductor at a river crossing is supported from two towers at height of
        50 and 80 meter above water level. The horizontal distance between the tower is 300 meters.
        If the tension in the conductor is 2000 kg. Find the clearance between the conductor and
        water at a point midway between the towers. Weight of conductor per meter = 0.844 kg.
        Assume that the conductor take the shape of parabolic curve.   **(10 Marks)**

OR

2   a. Discuss the advantage of high voltage transmission.   **(06 Marks)**
    b. Each line of a 3-phase system is suspended by a string of 3 similar insulation. If the voltage
        across the line unit is 17.5 KV. Calculate the line to neutral voltage. Assume that the shunt
        capacitance between each insulator and earth is $\frac{1}{8}$th of the capacitance of the insulator itself.
        Also find the string efficiency.   **(10 Marks)**

Module-2

3   a. Derive an expression for the inductance of a single phase two wire line.   **(06 Marks)**
    b. Explain the concept of self GMD and mutual GMD.   **(04 Marks)**
    c. A 3-phase, 50Hz, 132KV overhead line has conductor placed in a horizontal plane 4 meter
        apart. Conductor diameter is 2cm. If the line length is 100km. Calculate the charging current
        per phase. Assume complete transposition.   **(06 Marks)**

OR

4   a. Derive a expression for the capacitance of a 3-phase overhead line for symmetrical spacing
        and unsymmetrical spacing.   **(10 Marks)**
    b. Two conductors of a single phase line each of 1 cm diameter are arranged in a vertical plane
        with one conductor mounted 1m above the other. A second identical line is mounted at the
        same height as the first and spaced horizontally 0.25m apart from it. The two upper and the
        two lower conductors are connected in parallel. Determine the inductance per km of the
        resulting double circuit line.   **(06 Marks)**

Module-3

5   a. Two transmission lines having generalized circuit constants A_1, B_1, C_1, D_1 and A_2, B_2, C_2 D_2
        are connected in series. Develop expressions for the overall constants ABCD of the
        combination in terms of A_1, B_1 C_1 D_1 and A_2 B_2 C_2 D_2.   **(06 Marks)**
    b. Derive an expression for sending end voltage and current for long transmission line using
        rigorous solution.   **(10 Marks)**

OR

6 a. Explain with vector diagram the nominal π method for obtaining the performance of medium transmission line. **(08 Marks)**

b. An overhead 3-phase transmission line deliver 5000KW at 22 KV at 0.8 pf lagging. The resistance and reactance of each conductor is 4Ω and 6Ω respectively. Determine sending end voltage and transmission efficiency. **(08 Marks)**

Module-4

7 a. Discuss different factors affecting corona and corona loss. **(06 Marks)**

b. A single core lead sheathed cable has a conductor diameter of 3 cm. The diameter of the cable being 9 cm. The cable is graded by using two dielectrics of relative permittivity 5 and 4 respectively with corresponding safe working stresses of 30KV/cm and 20 KV/cm. Calculate the radial thickness of each insulation and the safe working voltage of the cable. **(06 Marks)**

c. A single core cable has a conductor diameter of 1cm and insulation thickness of 0.4cm. If the specific resistance of insulation is 5×10^{14} Ω. Cm. Calculate the insulation resistance for a 2 km length of the cable. **(04 Marks)**

OR

8 a. Derive the expression for the capacitance of a single core cable. **(06 Marks)**

b. A 33 KV, 50Hz, 3-phase underground cable 4 km long uses three single core cables. Each of the conductor has a diameter of 2.5 cm and the radial thickness of insulation is 0.5cm. Determine : i) capacitance of the cable/ phase ii) charging current/phase iii) total charging KVAR. The relative permittivity of insulation is 3. **(06 Marks)**

c. Explain the following terms with reference to corona :
   i) Critical disruptive voltage
   ii) Critical visual disruptive voltage. **(04 Marks)**

Module-5

9 a. Explain radial feeders for AC distribution system. Mention the characteristics of radial feeders. **(06 Marks)**

b. A 3-phase 4wire system supplies power at 400V and lighting at 230V. If the lamps in use require 70, 84 and 33 ampere in each of the three lines. What should be the current in the neutral wire? If a 3-phase motor is now taking 200A from the lines at a pf of 0.2 lagging. What should be the total current in each line and the neutral wire? Find also the total power supplied to the lamps and the motor. **(10 Marks)**

OR

10 a. Explain 3-phase 4 wire star connected unbalanced loads for AC distribution system. **(06 Marks)**

b. A single phase AC distributor AB 300 meter long is fed from end A and is loaded as under.
   i) 100A at 0.707 pf lagging 200m from point A
   ii) 200A at 0.8 pf lagging 300m from point A.
   The load resistance and reactance of the distributor is 0.2Ω and 0.1Ω per kilometer. Calculate the total voltage drop in the distributor. The power factors refer to the voltage at the far end. **(10 Marks)**

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