Transmission and Distribution VTU CBCS Question Paper Set 2018

CBCS Scheme

USN | | | | | | | | | | |

15EE43

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
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 usual notations derive an expression for the sag of a transmission line when the supports are at equal levels. **(06 Marks)**

b. Draw the line diagram of a typical transmission and distribution system indicating the standard voltage. **(05 Marks)**

c. Explain the various supporting structures used for the overhead transmission lines. **(05 Marks)**

OR

2 a. Derive an expression for string efficiency of a 3 disc string. **(06 Marks)**

b. What are the advantages of high voltage AC transmission line? **(04 Marks)**

c. The towers of height 30m and 90m respectively support a transmission line conductor at water crossing. The horizontal distance between the towers is 500m. If the tension in the conductor is 1600kg, find the minimum clearance of the conductor and water and also clearance midway between the supports. Weight of conductor is 1.5kg/m. Bases of the towers can be considered to be at water level. **(06 Marks)**

Module-2

3 a. Derive an expression for the inductance of a single phase two wire line. **(06 Marks)**

b. The three conductors of a 3-phase line are arranged at the three corners of a triangle of sides 2m, 2.5m and 4.5m. Calculate the inductance per km of the line when conductors are regularly transposed. The diameter of each line conductor is 1.24cm. **(05 Marks)**

c. Explain the process of transposition of transmission lines and its advantages. **(05 Marks)**

OR

4 a. Obtain an expression for potential difference between two conductors a and b in a system of m conductors. **(06 Marks)**

b. Calculate capacitance of 100km long 3-ϕ, 50Hz, overhead transmission line consisting of 3 conductors each of diameter 2cm and spaced 2.5cm at the corners of an equilateral triangle. **(05 Marks)**

c. Describe composite conductors. **(05 Marks)**

Module-3

5 a. Discuss the nominal T. Model of a medium transmission line with appropriate circuit diagram and phasor diagram and hence obtain the expression for regulation and A B C D constant for the same. **(10 Marks)**

b. A 110kV, 50Hz, 3-phase transmission line delivers a load of 40MW at 0.85 lagging pf at the receiving end. The generalized constants of the transmission line are $A = D = 0.95\angle 1.4°$, $B = 96\angle 78°$ ohm, $C = 0.0015\angle 90°$ mho. Find the regulation of the line and charging current use nominal T method. **(06 Marks)**

OR

6 a. A 3-phase short transmission line delivers 3MW at a pf of 0.8 lagging to a load. If the sending ends voltage is 33kV. Determine : i) Receiving end voltage ii) Line current iii) Transmission efficiency iv) Regulation. The resistance and reactance of each conductor are 5Ω and 8Ω respectively. **(10 Marks)**

b. Explain Ferranti effect. **(06 Marks)**

Module-4

7 a. What is meant by grading of cable? Explain capacitance grading. **(08 Marks)**

b. A single core lead covered cable has a conductor diameter of 3cm with insulation diameter of 8.5cm. The cable is insulated with two dielectrics with permittivities 5 and 3 respectively. The maximum stresses in the two dielectrics are 38kV/cm and 26kV/cm respectively then calculate radial thickness of insulating layers and the working voltage of the cable. **(08 Marks)**

OR

8 a. Explain the phenomenon of corona in overhead transmission line. **(05 Marks)**

b. Find the most economical diameter of a single core cable to be used on 66kV, 3-phase system, if the peak permissible stress is not to exceed 50kV/cm. Also find the overall diameter. **(05 Marks)**

c. Draw the cross sectional view of a single core cable and explain its construction. **(06 Marks)**

Module-5

9 a. Explain with neat sketch different failure modes of bath tub curves. **(05 Marks)**

b. Briefly explain radial and ring main distributors. **(05 Marks)**

c. Four lines A, B, C and D are connected to a common point O. Resistance of AO, BO, CO and DO are respectively 1, 2, 3 and 4Ω both 90 and return and feeding points A, B, C and D are maintained at 230, 250, 240 and 220V respectively. Find the potential of common point O assuming no load is tapped from there. **(06 Marks)**

OR

10 a. What is power quality? What are different power quality problems? **(05 Marks)**

b. Explain the term MTTF and MTBF. **(03 Marks)**

c. An electric train taking a constant current of 500A moves between the two substations 6 kms apart. The two substations are maintained at 580V and 600V respectively. The track resistance is 0.05Ω per km both 90 and return. Calculate :

i) The point of minimum potential

ii) The currents supplied by each substation at the point of minimum potential. **(08 Marks)**

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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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