CBCS Scheme

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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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