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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Fifth Semester, B.E. - Electrical and Electronics Engineering

Make-up Examination; Jan / Feb - 2017

Power Transmission and Distributions

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. Draw the diagram of a typical power supply scheme indicating standard voltages. **6**

b. Obtain the expression for Sag in a freely suspended conductor when the supports are at equal level. **7**

c. A transmission lines uses a hard drawn copper of area of cross section 200 mm^2 with a conductor 61/2.24 mm. The span of the line is 160 m with supports at the level. The maximum stress for a conductor is 41 kg/mm^2 with a factor of safety as 5. Calculate; **7**

i) Sag in still air

ii) Sag with a wind pressure of 1.35 kg/m and ice coating of 1.25 cm

iii) Vertical Sag with conditions as in (ii) above.

2 a. What are the advantages of high voltage transmissions? **6**

b. Write a note on : **7**

i) Stringing chart ii) Disadvantages of high voltage transmission.

c. Two towers of height 40 m and 30 m respectively support a transmission line conductor at water crossing. The horizontal distance between the towers is 300 m. If the tension in the conductor is 1500 kg, find the clearance of the conductor at a point midway between the supports. Weight of the conductor is 0.8 kg/m. Assume bases of the towers to be at water level. **7**

UNIT - II

3 a. Mention the types of Insulators. Explain pin type insulator in detail. **6**

b. The potential across the six units of string is equalized by using graded insulators. The capacitance of the top insulator is '8C' and that of Pin to earth is 'C'. Calculate the capacitance of the other units. **7**

c. Derive an expression for insulation resistance of a single core cable. **7**

4 a. Define string efficiency. Explain any two methods of improving string efficiency. **8**

b. What is meant by grading of cables? Briefly explain capacitance grading of cables. **7**

c. The inner and outer diameters of a cable are 3 cm and 9 cm respectively. The cable is insulated with two materials having permitivities of 5 and 4 respectively with corresponding maximum permissible stresses of 30 kV/cm and 20 kV/cm respectively. Calculate the radial thickness of each insulating layer and the safe working voltage of the cable. **5**

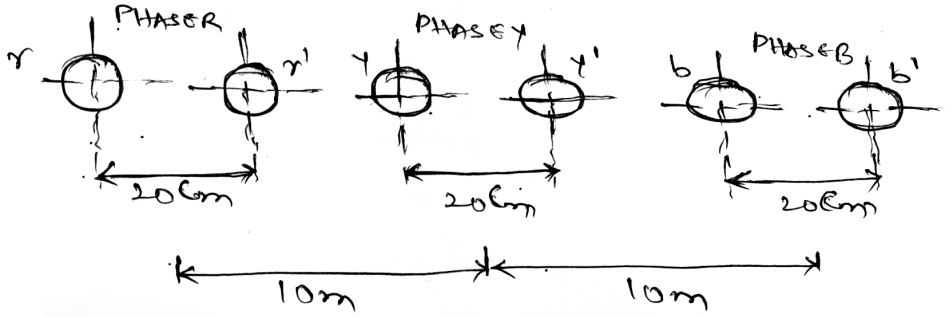
Contd.....2

UNIT - III

5 a. Derive an expression for inductance of a composite conductor line. **8**

b. What is transposing of conductors and why it is needed? **4**

c. Find the inductance per phase per km length of system of conductors shown in figure self GMD of conductors is 0.80 cm. The lines are transposed. **8**



6 a. Derive an expression for capacitance of a three phase line with equilateral spacing. **7**

b. In a 3 phase, 50 Hz, 66 kV overhead transmission system, the conductors are placed in a horizontal plane at equal distances of 2 m. The conductor diameter is 1.25 cm. If the line length is 100 km. Calculate : **6**

i) Capacitance / phase ii) Charging current /phase

Assume complete transposition of line.

c. Explain in detail the effect of earth on capacitance of transmission line. **7**

UNIT - IV

7 a. Derive an expression for ABCD constants of a medium transmission line using nominal T-method. Show that AD-BC = 1. **10**

b. A 3 phase 50 Hz overhead transmission line has the following constants per phase. R = 28 Ω, X = 63 Ω, Y = $4x10^{-4}$ ʊ. If the load at the receiving end is 75 MVA at 0.8 p.f. lag with 132 kV between lines. Calculate the voltage, current and p.f. at the sending end. Use nominal π method. **10**

8 a. Deduce the expression for voltage regulation and efficiency of single phase short transmission line with vector diagram. **7**

b. A single phase overhead transmission line delivers 1100 kW at 33 kV. 0.8p.f. lagging. The load resistance and inductive reactance of the lines are 10 Ω and 15 Ω respectively. Determine : **8**

i) Sending end voltage ii) Sending end power factor

iii) Transmission efficiency.

c. Write a note on Ferranti effect. **5**

Contd.....3

UNIT - V

9 a. Write note on :

i) Radial distribution system

ii) Feeders, distributors and service mains. **7**

b. Determine the critical descriptive voltage and critical visual descriptive voltage for a 3 phase 50 Hz, 132 kV line situated in a temperature of 30ºC and at a barometric pressure of 74 cm. The conductor diameter is 1.5 cm while the equilateral spacing between the conductors is 2.75 m. The surface irregularity factor is 0.9 while $m_v = 0.75$. **7**

c. A two wire dc distributor system is 3 km long and it supplies loads of 200 A, 100 A, 75 A and 50 A at 800 m, 1200 m, 2000 m and 3000 m from the feeding point A. Each conductor has go and return resistance of 0.004 Ω per 100 m. Calculate the voltage at each load point, if voltage at feeding point is 250 V. **6**

10 a. Write a note on :

i) Ring main distribution system

ii) Critical disruptive voltage

iii) Factors affecting and the methods to reduce Corona effect. **12**

b. An electric train taking a constant current of 500 A moves between two substations 6 km apart. The two substations are maintained at 580 V and 600 V respectively. The track resistance is 0.05Ω / km both go and return. Calculate; **8**

i) The point of minimum potential

ii) The current supplied by each substation at a minimum potential.

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