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Question Paper Code : 90517

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Fourth Semester

Electrical and Electronics Engineering

EE 8402 — TRANSMISSION AND DISTRIBUTION

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. "The Proximity effect is high in underground cables than overhead transmission Line"– Justify the given statement.

2. Find the value of capacitance of a 3ϕ overhead line when the radius of the conductor is 0.5cm and the spacing between the conductors is 300cm.

3. Brief on the transmission line loadability limit with a neat loadability Curve.

4. A three phase 132kv, 20MW long transmission line has its parameters given as $\sqrt{YZ} = 0.07495 + j0.2562$ and $\sqrt{\frac{Z}{Y}} = 444.83\angle -16.3°$.

   Calculate the line value of sending end voltage of the transmission line.

5. Validate the statement- "Suspension type insulator are used for the transmission of electrical power for voltages above 33 kV".

6. Brief on aeoline vibration and its cause on over head transmission line conductors.

7. Give reason for the following statement- "Intermediate sheaths type of grading is provided to improves voltage distribution of the dielectric of the cable".

8. Mention the different classification of cables based on the voltage rating.

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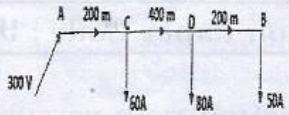
9. Find the voltage drop in the section CD of the given 2 wire DC distributor 800m long fed at one end as shown in the figure below. The resistance of one conductor is 0.4 /Km.

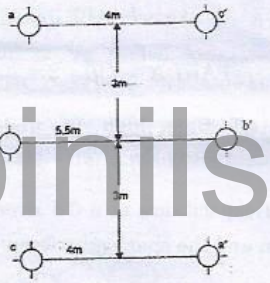


10. List out the limitations of Kelvin's law for finding economic size of the conductor.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Derive the inductance of unsymmetrically placed three phase conductor when transposed. (5)

(ii) Also, find the inductance per phase per km of a double circuit three phase line shown below. The transposed conductor are of radius 0.75cm each. (8)



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Or

(b) (i) Derive the expression for capacitance of a double circuit line for hexagonal spacing. (10)

(ii) Why the concept of self GMD is not applicable for capacitance calculation? (3)

12. (a) (i) A balance 3 phase transmission load of 30MW is supplied at 132 kV and 0.85 pf lagging using 80km length transmission line. The impedance of a single conductor is (20+j52) ohms and the total phase-neutral admittance is $315*10^{-6}$ Siemen. Using nominal T method determine A, B, C and D constants of the line, sending end voltage and regulation of the line. (10)

(ii) List out the limitations of nominal T method. (3)

Or

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(b) (i) Brief on end condenser method for short transmission line equivalent circuit. (5)

(ii) A single phase transmission line has total resistance, inductive reactance and susceptance as 25 ohms, 80 ohms and $14*10^{-14}$S. The receiving end voltage is 66000V when delivering a load of 15000 kW at 0.8pf. Calculate the percentage regulation and supply power factor using end condenser method. (8)

13. (a) Each line of the three insulators forming a string has a self- capacitance of C Farad. The shunt capacitance of each insulator is 0.2 C to earth and 0.1 C to line. A guard ring increases the capacitance of line of the metal work of the lowest insulator to 0.3 C. Calculate the string efficiency by considering and not considering guard rings.

Or

(b) (i) A transmission line has a span of 275m between level supports. The conductor has an effective of 1.96 cm and weights 0.865 kg/m. Its ultimate strength is 8060 kg. If the conductor has ice coating of radial thickness 1.27 cm and is subjected to a wind pressure of 3.9 gm/cm^2 of projected area, calculate sag for a safety factor 2. Weight of 1 C.C of ice is 0.91 gm. (5)

(ii) The towers of height 30 m and 90 m respectively support a transmission line conductor at water crossing. The horizontal distance between the towers is 500 m. If the tension in the conductor is 1600 kg, find the minimum clearance of the conductor and water. Also calculate clearance mid-way between the supports. Weigh of conductor is 1.5 kg/m. Consider the base of the tower at water level. (8)

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14. (a) (i) Write a note on Capacitive grading. (5)

(ii) A single core cable of conductor diameter 1.8 cm and lead sheath of diameter 5.4cm is to be used on a 66kV, 3 phase system. Two intersheaths of diameter 3 cm and 4.2 cm are used in between to obtain uniform distribution of stress. Find the voltage at which the two intersheaths are maintained if the maximum stress in the layer is same. (8)

Or

(b) (i) Brief on the construction of single core cable. (5)

(ii) A single core lead sheath cable has a conductor diameter of 3cm; 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 of 30kV/cm and 20 kV/cm. Calculate the safe working voltage of the cable. (8)

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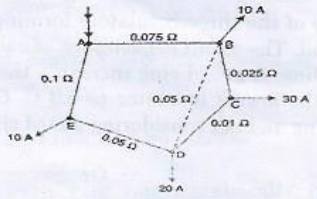
15. (a) (i) Graphically illustrate the calculation of economic sizing of conductor in a transmission line. (5)

(ii) A ring main distribution system is fed at A, with an interconnector connected between the point BD. The resistance of various sections are as indicated in the figure. Calculate the Thevenin's open circuit voltage and the current through the interconnector. (8)



Or

(b) Write short note on the following:

(i) Single bus bar (3)

(ii) Double breaker bus bar system (5)

(iii) Ring bus bar system. (5)

PART C — (1 × 15 = 15 marks)

16. (a) For the shown Fig. Q. 16 (a) stranded conductor calculate the self GMD. Consider the radius of each strand to be "r". Also give inference on GMR and GMD calculation.

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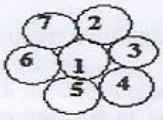

Fig. Q. 16 (a)

Or

(b) An electric train runs between two substation 6 km apart maintained at voltage 600 V and 590 V, respectively and draws a constant current of 300 A while in motion. The track resistance of go and return path is 0.04 Ω/km. Find the point along the track where minimum potential occurs, the current supplied by the substation A where the train is at the point of minimum potential and the current supplied by the substation B where the train is at the point of minimum potential.

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