

Reg.No.:



VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 80020

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2024

Fourth Semester

Electrical and Electronics Engineering

U19EE412 – TRANSMISSION AND DISTRIBUTION OF ELECTRICAL
ENERGY

(Regulation 2019)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

| | | | |
|--------------------------|--------------------|----------------|-----------------|
| Knowledge Levels (KL) | K1 – Remembering | K3 – Applying | K5 - Evaluating |
| | K2 – Understanding | K4 – Analyzing | K6 - Creating |

PART – A

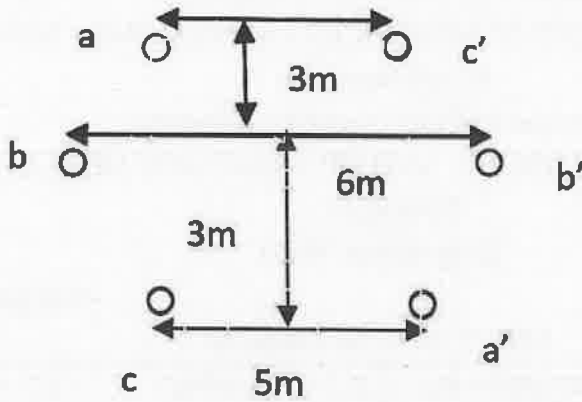
(10 x 2 = 20 Marks)

| Q.No. | Questions | Marks | KL | CO |
|-------|--|-------|----|-----|
| 1. | Define transposition. Justify why are transmission line transposed | 2 | K1 | CO1 |
| 2. | Discriminate between self GMD and Mutual GMD. | 2 | K4 | CO1 |
| 3. | Show the nominal T and π model of medium transmission line with its parameters filled. | 2 | K2 | CO2 |
| 4. | Mention the disadvantages of Corona. | 2 | K1 | CO2 |
| 5. | Classify the types of Insulators. | 2 | K2 | CO3 |
| 6. | List the modern practices adopted to avoid grading of cables. | 2 | K1 | CO3 |
| 7. | What is tower spotting? | 2 | K3 | CO4 |
| 8. | Give any two factors that affect sag in an overhead line. | 2 | K2 | CO4 |
| 9. | Draw the single line diagram of ring main distributor. | 2 | K1 | CO5 |
| 10. | List the types of HVDC links. | 2 | K1 | CO5 |

PART – B

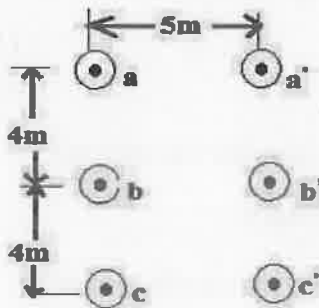
(5 x 13 = 65 Marks)

- | Q.No. | Questions | Marks | KL | CO |
|--------|---|-------|----|-----|
| 11. a) | Compute the inductance /phase /km of double circuit 3 phase line shown in fig. The line is completely transposed and operates at a frequency of 50 Hz. Radius $r = 6$ mm. | 13 | K3 | CO1 |



(OR)

- | | | | | |
|----|--|----|----|-----|
| b) | Determine the capacitance per phase of the double circuit line as shown in fig, consider the diameter is 2.1793cm. | 13 | K3 | CO1 |
|----|--|----|----|-----|



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|--------|--|----|----|-----|
| 12. a) | A 3 phase, 50 Hz power transmission line has line resistance of 30 ohm and inductive reactance of 70 ohm per phase. The capacitive susceptance is 4×10^{-4} mho per phase. If the load at the receiving end is 50 MVA at 0.8 pf lagging with 132 kV line voltage. Calculate | 13 | K3 | CO2 |
| | i. Voltage and current at sending end | | | |
| | ii. regulation and | | | |
| | iii. efficiency of the line for this load. Use nominal- π method. | | | |

(OR)

| | | | | | |
|-----|----|---|----|----|-----|
| | b) | The constants of a three- phase line are $A=0.9\angle 2^\circ$ and $B= 70$ ohms per phase. The line delivers 60 MVA at 132 kV and 0.8 pf lagging. Draw power circle diagrams find | 13 | K3 | CO2 |
| | | i. sending end voltage and power angle | | | |
| | | ii. the maximum power which the line can deliver with the above values of sending and receiving end voltages | | | |
| | | iii. the sending and end power and power factor | | | |
| | | iv. line losses. | | | |
| 13. | a) | i. Explain the general construction of an underground cable with a neat sketch | 7 | K2 | CO3 |
| | | ii. A single core cable used on 33 kV, 50 Hz has conductor diameter 10 mm and inner diameter of sheath 25 mm. The relative permittivity of insulating material used is 3.5 Calculate | 6 | K3 | CO3 |
| | | a. Capacitance of the cable per km | | | |
| | | b. Maximum and minimum electrostatic stress in the cable | | | |
| | | c. Charging current per km | | | |
| | | (OR) | | | |
| | b) | With neat diagram, explain the various methods of grading of underground cables. | 13 | K2 | CO3 |
| 14. | a) | i. Explain any one type of insulators with a neat diagram. | 6 | K4 | CO4 |
| | | ii. Calculate the maximum voltage that a string of 2 suspension insulators and that of 3 suspension insulators can withstand, if the maximum voltage for each insulator is not to exceed 170 kV. The capacitance between each link pin and earth is 20% of that of self-capacitance of each insulator | 7 | K3 | CO4 |
| | | (OR) | | | |
| | b) | i. Define string efficiency. Describe the methods to improve it. | 6 | K1 | CO4 |
| | | ii. Each line of 3 phase system is suspended by the string of 3 identical insulators of self-capacitance 'C' Farad. The shunt capacitance of connecting metal work of each insulator is 0.2 C to earth and 0.1 C to line. Calculate the string efficiency of the system if a guard ring increases the capacitance to the line of metal work of the lowest insulator to 0.3 C. | 7 | K3 | CO4 |

15. a) Discuss the advantages of HVDC transmission over HVAC transmission in detail 13 K2 CO5

(OR)

b) A 2 wire D.C street mains AB, 600 m long if fed from both ends at 220 V. Loads of 20 A, 40 A, 50 A, and 30 A are tapped at distances of 100 m, 250 m, 400 m and 500 m from the end A respectively. If the area of cross section of distributor conductor is 1 square centimetre, calculate the minimum consumer voltage. Take $\rho = 1.7 \times 10^{-6} \Omega\text{-cm}$. 13 K3 CO5

PART – C

(1 x 15 = 15Marks)

| Q.No. | Questions | Marks | KL | CO |
|--------|--|-------|----|-----|
| 16. a) | Determine the efficiency and regulation of a 3 phase 100 km, 50 Hz transmission line delivering 20 MW at a p.f of 0.8 lagging and 66 kV to a balanced load. The conductors are copper, each having resistance $0.1 \Omega/\text{km}$, 1.5 cm outside dia, spaced equilaterally 2 m between centers. Neglect reactance and use (i) Nominal T (ii) Nominal π method. | 15 | K3 | CO2 |
| (OR) | | | | |
| b) | An overhead line has a span of 160 m of stranded copper conductor between level supports. The sag is 3.96 m at -5.5°C with 9.53 mm thick in ice coating and wind pressure of 40 kgf/m^2 of projected area. Calculate the temperature at which the sag will remain the same under conditions of no ice and no wind. The particulars of the conductor are as follows: size of conductor = $7/3.45 \text{ mm}$, Area of cross section = 64.5 mm^2 weight of conductor = 0.594 kgf/m , Modulus of elasticity = 12700 kgf/mm^2 , coefficient of linear expansion = $1.7 \times 10^{-5} / ^\circ\text{C}$, Assume 1 m^3 of ice to weight 913.5 kgf . | 15 | K4 | CO4 |