

**ANURAG Engineering College****(An Autonomous Institution)****III B.Tech I Semester Supplementary Examinations, December – 2024****POWER SYSTEMS - II****(ELECTRICAL AND ELECTRONICS ENGINEERING)****Time: 3 Hours****Max. Marks: 75****Section – A (Short Answer type questions)****(25 Marks)****Answer All Questions**

|   | Course Outcome | B.T Level | Marks |
|---|----------------|-----------|-------|
| 1. What are the merits of bundled conductors?   | CO1            | L1        | 2M    |
| 2. Draw the equivalent circuit of long transmission line.   | CO1            | L2        | 3M    |
| 3. What is meant by surge impedance loading?  | CO2            | L1        | 2M    |
| 4. Write ABCD constants for medium transmission lines using nominal T and $\pi$ methods.            | CO2            | L2        | 3M    |
| 5. Define wave length and velocity of propagation.  | CO3            | L2        | 2M    |
| 6. What are the expressions for the voltage and current when a line is terminated by an inductance? | CO3            | L3        | 3M    |
| 7. What are the factors affecting corona.   | CO4            | L2        | 2M    |
| 8. What is the need for Stringing Chart?  | CO4            | L2        | 3M    |
| 9. List the merits of suspension type insulators over pin type insulators.                          | CO5            | L1        | 2M    |
| 10. What is the effect of ice and wind on Sag calculations  | CO5            | L3        | 3M    |

**Section B (Essay Questions)****Answer all questions, each question carries equal marks.****(5 X 10M = 50M)**

|   |     |    |     |
|---|-----|----|-----|
| 11. A) Derive the expression of the inductance for a 3 phase double circuit overhead transmission line under unsymmetrical spacing.   | CO1 | L2 | 10M |
| <b>OR</b>   |     |    |     |
| B) Calculate the capacitance per phase of a three phase, three wire system, when the conductors are arranged in a horizontal plane with spacing $D_{12}=D_{23}=3.5\text{m}$ , and $D_{13}=7\text{m}$ . The conductors are transposed and each has a diameter of 2.0 cm. | CO1 | L1 | 10M |
| 12. A) Explain the Ferranti effect with a phasor diagram and its causes.  | CO2 | L2 | 10M |
| <b>OR</b>   |     |    |     |
| B) A 275 kV overhead transmission line has the following characteristics: $Z = (12.5 + j 66) \Omega$ , $Y = 4.4 \times 10^{-4} \angle 90^\circ \text{ S}$ . Calculate the ABCD constants and the surge impedance of the line.   | CO2 | L2 | 10M |
| 13. A) Explain the behavior of a travelling wave when it reaches the end of short circuited line. Draw diagrams to show voltage and current of the line before and after the wave reaches the end   | CO3 | L3 | 10M |
| <b>OR</b>   |     |    |     |
| B) A 440 kV surge travels on an overhead line of surge impedance 500 $\Omega$ towards its junction with a cable which has a surge impedance of 50 $\Omega$ . Determine:   | CO3 | L4 | 10M |
| i) transmitted voltage and current,   |     |    |     |
| ii) reflected voltage and current   |     |    |     |

14. A) Find the voltage distribution and string efficiency of a 3-unit suspension insulator string if the capacitances of the link pins to earth and to the line are respectively 20% and 10% of the self-capacitance of each unit. If a guard ring increases the capacitance to the line of lower link pin to 35% of the self-capacitance of each unit, find the redistribution of voltage and string efficiency. CO4 L2 10M
- OR**
- B) A single-phase overhead line has two conductors of diameter 1 cm with a spacing of 1 meter between centers. If the dielectric strength of air is 21 kV/cm, determine the line voltage for which corona will commence on the line. CO4 L2 10M
15. A) i) Explain the capacitance grading of cables. CO5 L2 4M  
 ii) An overhead line has the following data: span length 160 meters, conductor diameter 0.95 cm, weight per unit length of the conductor 0.65 kg/meter. Ultimate stress 4,250 kg/cm<sup>2</sup>, wind pressure 40 kg/cm<sup>2</sup> of projected area. Factor of safety 5. Calculate sag. CO5 L3 6M
- OR**
- B) Derive the expressions for sag and tension when the supports are at unequal heights. CO5 L3 10M