CBCS SCHEME

USN | | | | | | | | | | |

18EE43

Fourth Semester B.E. Degree Examination, June/July 2025
Transmission and Distribution

Time: 3 hrs. Max. Marks: 100

Note : 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Assume any missing data.***

Module-1

1 a. Draw the line diagram of a typical transmission and distribution scheme indicating voltage levels used at different stages. **(06 Marks)**

b. An overhead line has a span of 150 m between level supports. The conductor has a cross – sectional area of 2 cm^2. The ultimate strength is 5000 kg/cm^2 and safety factor is 5. The specific gravity of the material is 8.9 gm/CC. The wind pressure is 1.5 kg/m. Calculate the height of the conductor above ground level at which it should be supported if a maximum clearance is 7 m is to be left between the ground and the conductor. **(08 Marks)**

c. What are line vibrations dampers? Explain its importance in transmission line. **(06 Marks)**

OR

2 a. An overhead transmission line has a span of 200 m between the supports. The supports are at the same level. The area of cross – section of conductor is 1.9 cm^2 while the ultimate strength is 5000 kg/cm^2. The specific of the conductor material is 8.9 gm/cm^3. If the conductor is subjected to the wind pressure of 1.5 kg/m length. Calculate the sag if factor of safety is 5. Also calculate the vertical sag. **(08 Marks)**

b. A string of 4 insulators has self capacitance equal to 5 times the pin to earth capacitance. Calculate i) Voltage distribution across various units as a percentage of total voltage across the string ii) String efficiency. **(06 Marks)**

c. Explain the following types of conducting materials used as transmission line in brief :
i) ACSR ii) GTACSR iii) GZTACSR iv) ZTAI. **(06 Marks)**

Module-2

3 a. Determine the inductance per kilometer of 3 phase transmission line using 20 mm diameter conductors when conductor are situated at the corners of a triangle with spacing of 4, 5, and 6 mm. The conductors are regularly transported. **(06 Marks)**

b. Derive the expression for capacitance of a three phase line with symmetrical spacing but transposed. **(06 Marks)**

c. A single core cable is used on a 66 KN, 3 phase system. The core diameter is 1.2 cm while the insulation thickness is 1.5 cm. If PVC of relative permissivity 4.8 is used as dielectric. Calculate the capacitance of cable and its charging current. The supply frequency is 50 Hz. Assume cable length to be 1.5 km. **(08 Marks)**

OR

4 a. A 3 phase circuit , 50Hz , line consists of three conductors each of diameter 21 mm the spacing between the conductors is as follows. Here to A – B = 2.5 mm , B – C = 45 mm , C – A = 3.5 mm. Find the capacitance and capacitive reactance per phase per kilometer of the line. The line is transposed at regular intervals. **(07 Marks)**

b. Deduce the equation for inductance of three phase line with unsymmetrical spacing but transposed. **(07 Marks)**

c. Derive the expression for line to neutral capacitance for a three phase overhead line when the conductors are symmetrically spaced. **(06 Marks)**

Module-3

5 a. List out the different types of classification of transmission lines with usual circuit representation and details. **(06 Marks)**

b. A three phase line delivers 3000 KW at a pf of 0.8 lagging to a load. If the sending end voltage is 33 KV, determine

i) Receiving end voltage

ii) Line current

iii) Transmission efficiency. The resistance and reactance of each conductor is 5 Ω and 8 Ω respectively. **(08 Marks)**

c. Deduce the expression for transmission efficiency and regulation for medium transmission line using i) Nominal T method ii) Nominal π method. **(06 Marks)**

OR

6 a. A 50 Hz , 3 – phase transmission line 30 km has a total series impedance of (40 + j 125) Ω and shunt admittance of 10^{-3} mho. The load is 50 MW at 220 KV with 0.8 lagging power factor. Find the sending end voltage, current and power factor.
(Use nominal –π representation). **(07 Marks)**

b. Compare AC and DC cables and their limitations. **(06 Marks)**

c. A 110 KV , 50 HZ , 3 – phase transmission line delivers a load of 40 MW at 0.85 lag at the receiving end. The generalized constants of the transmission line are $A = D = 0.95 \angle 1.4^\circ\ \Omega$, $B = 96 \angle 78^\circ\ \Omega$, $C = 0.0015 \angle 90^\circ$ mho. Find the regulation of the line and charging current.
(Use nominal π method). **(07 Marks)**

Module-4

7 a. What is Dielectric loss? Explain with relevant circuit and expressions. **(06 Marks)**

b. What are the advantages and disadvantages of Corona? What are the factors affecting the Corona loss? Also list out the methods to reduce Corona discharge. **(06 Marks)**

c. Determine the critical descriptive voltage and the critical visual disruptive voltage for a 3 phase, 50 Hz , 132 KV line situated in a temperature of 30°C 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 $m_v = 0.75$. **(08 Marks)**

OR

8 a. What is grading of cable? Why is it necessary? Show the variation of stress in an ungraded single core cable. **(06 Marks)**

b. A two core cable is 500 m long. The total resistance go and return is 0.075 Ω. The cable is uniformly loaded with 2 A/m load and is fed from both the ends at 180 V. Prove that the minimum potential point occurs at the midpoint of the cable and calculate the value of minimum potential and total power loss in the cable. **(08 Marks)**

c. A single core cable is having conductor diameter of 2 cm and consisting of three A, B and C insulating materials of permittivities 5, 4 and 2 and permissible stress of 50, 40 and 30 KV/cm respectively. If the line is designed for 110 KV , find the internal sheath radius of the cable. **(06 Marks)**

Module-5

9 a. Explain about the AC distribution with various feeder systems. **(06 Marks)**

b. In a 3 – phase , 4 wire , 40 d 230V system a lamp of 100 watts is connected to one phase and neutral and a 1 amp of 200 watts is connected to the second phase and the neutral. Calculate the voltage across each lamp when the neutral wire is disconnected. **(08 Marks)**

c. Explain about reliability aids and the need standards. **(06 Marks)**

OR

10 a. A single phase AC distributor 500 m long has a total impedance of $(0.02 + j0.04)\Omega$ and is fed from one end at 250V. It is loaded as under :

i) 50 A at unity power factor 200 m feeding point.

ii) 100 A at 0.8 pf lagging 300 m feeding point.

iii) 50 A at 0.6 pf lagging at the far end.

Calculate the voltage drop and voltage at the far end. **(08 Marks)**

b. Discuss the limitations of distribution system based on various parameters. **(06 Marks)**

c. Explain the consequences of disconnection of neutral in a 3 phase, 4 wire systems. **(06 Marks)**

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