

Code: 9A02502

R09

III B. Tech I Semester (R09) Supplementary Examinations, May 2012

TRANSMISSION OF ELECTRIC POWER

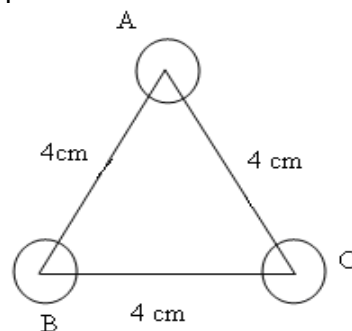
(Electrical & Electronics Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Show that the inductance of single-phase two wire transmission line is $4 \times 10^{-7} \ln(d/r')$ H/m, where d is the distance between the conductors and r' is the geometric mean radius of the conductor.
- (b) A single circuit, 50 Hz, 3- ϕ transmission line consists of three conductors arranged as shown in the figure has conductor diameter of 1.8 cm each, the conductor being spaced as shown in the figure. The line is transposed. Find the inductance of the line per km per phase.



- 2 Derive the expressions for A, B, C, D parameters of a nominal π -T and π of a medium length transmission lines.
- 3 Derive the expressions for voltage and current distributions over a long line. Explain the significance of characteristic impedance loading in connection with the long lines.
- 4 A cable of surge impedance of 100 ohms is terminated in two parallel-connected, open-wire lines having surge impedances of 600 and 1000 ohms respectively. If a steep-fronted voltage wave of 1000 V travels along the cable, find from the first principles the voltage and current in the cable and the open-wire lines immediately after the travelling wave has reached the transition point. The line may be assumed to be of infinite length.
- 5 Determine the corona characteristics of a 3-phase line 160 km long, conductor diameter 1.036 cm, 2.44 m delta spacing, air temperature 26.67°C , altitude 2440 m, corresponding to an approximate barometric pressure of 73.15 cm of Mercury, operating voltage 110 kV at 50 Hz. Note: Assume the data if required (irregularity factors etc.).
- 6 Write and explain different types of insulators used for overhead lines with neat diagrams.
- 7 (a) Write short notes on stringing charts.
(b) A 110 kV transmission line has the following data: Weight of conductor = 750 kg/km; length of span = 250 m, ultimate strength = 3000 kg, safety factor = 2. Calculate the height above the ground at which the conductor should be supported. Ground clearance required is 10 meters.
- 8 (a) Briefly explain what is meant by capacitance grading of a cable.
(b) The capacitance per kilometer of a 3-phase belted cable is $0.18 \mu\text{F}$ between two cores with the third core connected to sheath. Calculate the KVA taken by 20 km long cable when connected to 3-phase, 3300 V supply.
