Registration no.: | | | | | | | | | | |

Total Number of Pages: 02 **B. Tech/ IDD (B.Tech and M.Tech)**
REL5C001

5th Semester Regular/Back Examination: 2024-25
ELECTRIC POWER TRANSMISSION & DISTRIBUTION
EEE, ELECTRICAL, EE
Time: 3 Hours
Max Marks: 100
Q Code: R391
Answer all questions of Part-I, any 08 questions of (Part-II) and any two from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1 Objective Answer Type Questions (Answer All) **(2 x 10)**

a) What is most common generating voltage in India? Why are the generating voltages stepped up before transmission of power over long distances?
b) What is ACSR conductor? Explain briefly.
c) The voltages at the two ends of a line are 132 kV and its reactance is 40 ohms. What is the capacity of the line in MW?
d) What is method of images? Briefly explain for the calculation of capacitance of transmission lines.
e) The surge impedance of a 3-phase, 400 kV transmission line is 400 Ω. Find the surge impedance loading (SIL).
f) What is stringing chart? Why is it useful? Explain briefly.
g) The ABCD constants of a 3-phase transmission line are A = D = 0.8 ∠1° ; B = 170 ∠85° ; C = 0.002 ∠90.4° mho. The sending end voltage is 400 kV. Find the receiving end voltage under no load condition.
h) Compare Hydroelectric Power Generation, Thermal Power generation and Nuclear power generation in terms of their gestation period.
i) State the advantages of ring main distribution system over radial distribution system
j) The currents in a 3-phase unbalanced system are: I_R = (12 + j6) A; I_Y = (12 – j12) A; I_B = (–15 + j10) A. The phase sequence is RYB. What is the zero phase sequence component in R-phase? Briefly explain.

Part- II

Q2 Focused-Short Answer Type Questions- (Answer Any Eight) **(6 x 8)**

a) Write a short note on- Nuclear Power Generation.
b) What will be the equivalent radius of a bundle conductor having its part conductors of radius 'r' on the periphery of a circle of dia 'd' if the number of conductors is 2, 3, 4, 6?
c) Explain clearly the 'skin effect' and 'proximity effect' when referred to overhead lines.
d) A 400 V, 3-phase 4-wire service mains supplies a star connected load. The resistance of each line is 0.1 ohm and that of neutral 0.2 ohm. The load impedances are Z_R = (6 + *j*9), Z_Y = 8 ohms and Z_B = (6 – *j*8). Calculate the voltage across each load impedance and current in the neutral. Phase sequence RYB.

e) Justify the need of capacitors in distribution systems.

f) An overhead line has the following data: Span length 160 metres, conductor dia 0.95 cm, weight per unit length of the conductor 0.65 kg/metre. Ultimate stress 4250 kg/cm^2, wind pressure 40 kg/m^2 of projected area. Factor of safety 5. Calculate the sag.

g) Describe the vibration of power conductors and the methods used to damp out these vibrations.

h) The line-to-ground voltages on the high voltage side of a step-up transformer are 100 kV, 33 kV and 38 kV on phases *a*, *b*, and *c* respectively. The voltage of phase-a leads that of phase-*b* by 100° and lags that of phase-*c* by 176.5°. Determine analytically the symmetrical components of voltage.

i) Derive an expression for Sag of a line supported between two supports of same height.

j) Compare overhead lines with underground cables.

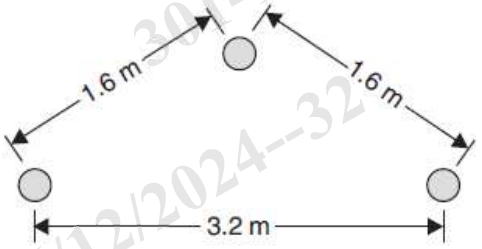
k) What is Kelvin's Law? State the limitations of Kelvin's Law.

l) Determine the insulation resistance of cable and find the condition for maximum value of electrostatic stress in a single core cable.

Part-III
Long Answer Type Questions (Answer Any Two)

Q3 **a)** Explain the concept of self GMD and mutual GMD for evaluating inductance of transmission lines. **(4+6+6)**

b) Determine the inductance of a 3-phase line operating at 50 Hz and conductors arranged as shown below. The conductor diameter is 0.8 cm.



c) Determine the capacitance and the charging current per km when the transmission line shown above is operating at 132 kV.

Q4 How the transmission lines are categorized on the basis of its length? Explain each of these transmission lines with its equivalent circuit and phasor diagrams. **(16)**

Q5 **a)** Determine the voltage across each disc of suspension insulators as a percentage of the line voltage to earth. The self and capacitance to ground of each disc is C and 0.2C respectively. The capacitance between the link pin and the guard ring is 0.1C. **(8+8)**

b) If the capacitance to the line of the lower link pin were increased to 0.3C by means of a guard ring, determine the redistribution of voltage. Also determine the string efficiency in each case.

Q6 **a)** Develop an equivalent network showing the interconnection of sequence networks to simulate a double line to ground fault. **(8+8)**

b) Explain under-ground cables, their types and construction.