22529

12223

3 Hours / 70 Marks

Seat No. | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following : 10

(a) Draw reactance diagram of typical power system layout.

(b) State the role of power system engineer. (any 4)

(c) Define self GMD and mutual GMD.

(d) List two effects of capacitance in transmission line.

(e) State the units of generalized circuit constants of a transmission line.

(f) Recall X and Y coordinate for centre of receiving end circle diagram.

(g) List two advantages of generalized circuit representation.

2. Attempt any THREE of the following : 12

(a) Develop the single line diagram showing the essential components of power system.

(b) Calculate inductance of a 500 m long, 1-phase, 2-wire transmission line. Each wire has identical area of cross section of 10 cm^2 and conductors are separated by a distance of 5 m.

(c) Explain the step wise procedure for drawing receiving end circle diagram.

(d) A medium transmission line has series impedance is (23 + j51) ohms/ph and shunt admittance is 325×10^{-6} siemens / phase. Calculate A, B, C, D constants of the line assuming nominal 'T' circuit.

3. Attempt any THREE of the following : 12

(a) State the various factors that influence Proximity effect and skin effect.

(b) A 275 kV transmission line has $A = 0.80 \angle 4°$, $B = 250 \angle > 4°$. Determine the power at unity power factor that can be received if the voltage at each end is maintained at 2 > 5 kV.

(c) Draw receiving end circle diagram for system having $V_R = V_S = 220$ kV, $A = 0.8 \angle 3$, $B = 100 \angle 75$. Calculate Max. power delivered.

(d) Explain Method of image to consider the effect of earth field on transmission line capacitance.

4. Attempt any THREE of the following : 12

(a) State the expression for complex power at receiving end of transmission line. Derive the condition for maximum power at receiving end.

(b) A 3-phase, 132 kV, 90 km, 50 Hz single circuit line has horizontal spacing with 5.5 m between adjacent conductors. The conductor diameter is 1.4 cm. Find the line capacitance per phase.

(c) Explain generalized circuit constants of two networks connected in series.

(d) State the advantages of per unit method for representing power system parameters.

(e) Calculate complex power for power system having voltage of $230 \angle 0$ and current $5\angle 30$.

5. Attempt any TWO of the following : 12

(a) A 150 km, 3-phase, 110 kV, 50 Hz transmission line transmits a load of 50,000 kW at 0.8 P.F. lag at receiving end. Resistance / km / phase = 0.18 ohm, reactance / km / phase = 0.62 ohm, admittance / km / phase = 10^{-5} siemens. Determine the constant A of the transmission line. Find regulation of the line.

(b) Obtain derivation for complex power, real power and reactive power for sending end of the transmission line using GCE.

(c) Explain necessity of reactive power compensation. List out name of the four reactive power compensation devices.

6. Attempt any TWO of the following : 12

(a) (i) Explain concept of Generalized circuit constant.

(ii) Compare between short and medium transmission line based on parameters & GCC constants.

(b) A 320 km, 275 kV three phase transmission line has the following general parameters.

$A = 0.94 \angle 1.0°$, $B = 107\angle 78°$ ohm.

If the receiving end voltage is 275 kV, Calculate the sending end voltage necessary if a load of 300 MW at 0.9 Lagging P.F. is being delivered at the receiving end.

(c) Explain the different parameters of the transmission line. Also state their significance.