22529

12425

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.

Marks

1. Attempt any FIVE of the following : **10**

(a) Write any two advantages of "Per Unit System".

(b) Draw equivalent circuit of an alternator.

(c) List the components of transmission line.

(d) Define Self GMD and Mutual GMD.

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

(f) A short transmission line has series impedance of $(10 + j25)\Omega$, calculate A, B, C, D generalized circuit constant.

(g) Recall X and Y co-ordinate for centre of receiving end circle diagram.

2. Attempt any THREE of the following : **12**

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

(b) Calculate the inductance per km of a line consisting of solid conductor of 30 mm diameter placed at the corners of triangle with side 3 m, 4 m and 5 m. The conductors are adequately transposed.

(c) Define generalized circuit constant of transmission line in power system.

(d) Derive the expression for complex power, active and reactive power at sending end.

3. Attempt any THREE of the following : **12**

(a) Summarise the role of power system engineer.

(b) Explain skin effect and list out four factors affecting skin effects.

(c) A 3 phase overhead transmission line has a total series impedance per phase of $200\angle 80°\ \Omega$ and total shunt admittance of $0.0013\angle 90°$ Siemens per phase. Calculate the value of A and B constants for nominal 'π' network.

(d) Calculate receiving end maximum power for 3 phase line operating at 230 kV and 220 kV on sending end and receiving end respectively. Line parameter has $A = 0.9\angle 1.5°$, $B = 100\angle 75°$.

4. Attempt any THREE of the following : **12**

(a) Describe the necessity of reactive power compensation. List the reactive power compensation devices.

(b) Calculate the capacitance of a 100 km long, 50 Hz overhead transmission line consisting of three conductors each of diameter 2 cm, spaced 2.5 m at corners of equilateral triangle.

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

(d) Derive the condition for maximum power transferred at receiving end.

(e) A 3 phase 50 Hz line has resistance of 10 Ω and inductance of 0.1 H and capacitance of 1 μF. Calculate A, B, C, D constants of line consisting "π" model.

5. Attempt any TWO of the following : **12**

(a) Derive the expression for inductance of three phase line (single circuit) composed of solid conductors with symmetrical spacing.

(b) Write step by step procedure for drawing sending end circle diagram.

(c) A 3 ph line has the following line parameters A = 0.93∠1.5°, B = 115∠77°. If the receiving end voltage is 275 kV, determine the sending end voltage, if the load of 250 MW at 0.85 lagging power factor is being delivered at receiving end.

6. Attempt any TWO of the following : **12**

(a) A 200 kV transmission line has A = 0.86∠7°, B = 300∠75° Ω. Determine real power at unity power factor that can be received if $V_S = V_R = 200$ kV.

(b) A 132 kV, 3 ph line has constant A = 0.9∠2.5°, B = 100∠70° Ω C = 0.0006∠80° Siemens. Draw the receiving end power circle diagram for a load of 40 MW at 0.8 p.f. lagging at receiving end and determine sending end voltage.

(c) Prove AD – BC = 1 for generalized circuit with "π" network.
