

316331

25226

3 Hours / 70 Marks

Seat No.

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- 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) Define complex power and state its formula.
 - b) State the concept and method of image to consider earth effect on capacitance.
 - c) State the impact of resistance and inductance in transmission line performance
 - d) List two characteristics of SLFE.
 - e) List two advantages of generalised circuit representation.
 - f) State two role of power system engineer.
 - g) List two advantages of graphical analysis by using circle diagram.

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- 2. Attempt any THREE of the following : 12**
- a) Define Generalized Circuit Constants (GCC).
 - b) Derive expression for inductance of three phase line composed of solid conductors with symmetrical spacing.
 - c) Find the A, B, C, D parameters of a 3-phase 80 km, 50 Hz transmission line with series impedance of $0.14 + j0.75$ ohm per km and a shunt capacitance of $j4 \times 10^{-6}$ mho per km.
 - d) Explain the step wise procedure for drawing receiving end circle diagram.
- 3. Attempt any THREE of the following : 12**
- a) Give the expression for centre co-ordinates and radius of circle diagram for sending end.
 - b) A 275 KV transmission line has $A = 0.80 \angle 4^\circ$, $B = 250 \angle 74^\circ$. Determine the power at unity power factor that can be received if the voltage at each end is maintained at 275 KV.
 - c) Explain the concept of self GMD and mutual GMD.
 - d) For a generalized circuit, prove that $AD - BC = 1$.
- 4. Attempt any THREE of the following : 12**
- a) List out data required for load flow studies.
 - b) A 3-phase, 132 KV, 90 Km, 50Hz single circuit line has horizontal spacing with 5.5m between adjacent conductors. The conductor diameter is 1.4cm. Find the line capacitance per phase.
 - c) Obtain derivation for complex power, real power and reactive power for sending end of the transmission line using GCE.
 - d) Explain procedure to draw circle diagram for sending end.
 - e) A 220KV transmission line has GCC. $A = 0.95 \angle 5^\circ$, $B = 100 \angle 85^\circ$. Determine maximum power that can be delivered if voltage at both end is maintained at 200KV.

5. Attempt any TWO of the following :

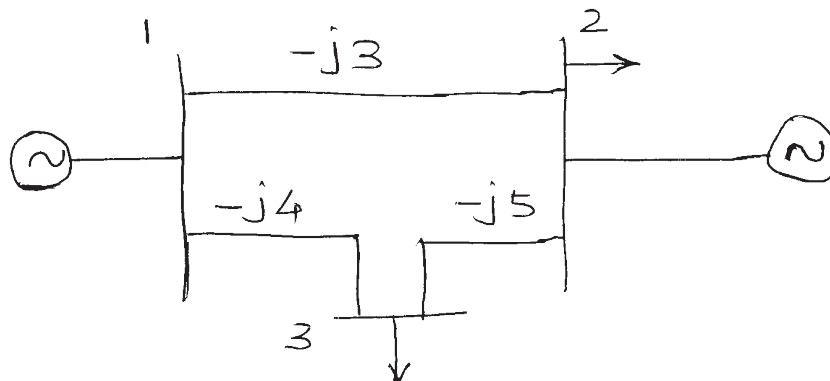
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- A 132KV, 50Hz, 3-phase transmission line delivers a load of 60MW at 0.8 P.F. lagging at the receiving end. The generalized constants of the transmission line are $A = 0.97\angle 1.5^\circ$, $B = 96\angle 74^\circ$, $C = 0.0015\angle 89^\circ$. Calculate the sending end voltage.
- Derive an expression for capacitance of single phase transmission line.
- Obtain the condition for maximum power transferred at receiving end.

6. Attempt any TWO of the following :

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- A three bus power system network, is shown in Fig. No. 1. The relevant per unit (PU) line admittances are indicated on the diagram. Develop Y bus matrix for the given power system network.

**Fig No. 1**

- Draw receiving end circle diagram of power system with following data :
 $A = 0.99\angle 3^\circ$, $B = 110\angle 88^\circ$ V_S and V_R are maintained at 110KV and 100KV respectively. Determine maximum power received.
- List any three information obtained from load flow studies.
 - Obtain an expression of capacitance of three phase line (Single circuit) with asymmetrical spacing.