16172

3 Hours / 100 Marks Seat No. | | | | | | | | |

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

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

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

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

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

Marks

1. Attempt any FIVE of the following : **20**

(a) Explain the role of a power system engineer.

(b) Compare between AC resistance and DC resistance. (any four point)

(c) State four advantages of generalized circuit representation.

(d) Explain concept of circle diagram.

(e) Draw a single line diagram showing the essential components in a modern power system.

(f) Explain factors affecting transient stability.

(g) State and explain proximity effect.

2. Attempt any TWO of the following : **16**

(a) Explain generalised circuit constant of two networks connected in series and connected in parallel.

(b) Draw and explain procedure of receiving end circle diagram.

(c) A 3-phase, 50 Hz transmission line has flat horizontal configuration with 3.5 m between adjacent conductors. The conductors are hard drawn seven strand copper (outside conductor diameter = 1.05 cm). The voltage of the line is 110 kV. Find the capacitance to neutral and the charging current per km.

3. Attempt any TWO of the following : **16**

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

(b) Explain following terms :

(i) Power system stability.

(ii) Dynamic state stability.

(iii) Overall stability.

(iv) Steady state stability.

(c) (i) Explain effect of temperature on transmission line resistance.

(ii) Derive an expression for potential difference between two conductors in a group of charged conductors.

4. Attempt any TWO of the following : **16**

(a) (i) Explain basic structure of power system.

(ii) What is self GMD and mutual GMD ? Where the concept is applied ?

(b) A 275 kV, 3-phase line has the following line parameters. A = 0.94 $\angle$1.9°, B = 120$\angle$79°. If the receiving end voltage is 275 kV, determine

(i) Sending end voltage if a load of 200 MW at 0.8 lagging p.f. is being delivered at the receiving end.

(ii) Maximum power that can be delivered if sending end voltage is 295 kV and receiving end voltage is 275 kV.

(c) (i) Derive the expression for flux linkages of an isolated current carrying conductor due to internal flux only.

(ii) State adverse effects of instability.

5. Attempt any TWO of the following : **16**

(a) (i) What is Swing equation ? State the meaning of each term of swing equation.

(ii) What is power angle diagram ? How it is used to determine system stability ?

(b) Prove that AD – BC = 1 for medium transmission line network.

(c) A 132 kV overhead transmission line has the following line constants :

A = D = 0.99 $\angle$ 0.3°, B = 70 $\angle$ 69° Ω, C = $4 \times 10^{-4} \angle 90°$ ℧. Calculate the sending-end voltage of transmission line if the load delivered at the receiving end is 45 MVA at 0.8 p.f. lag.

P.T.O.

6. Attempt any TWO of the following : **16**

(a) Explain the procedure for determination of ratings of reactive power compensating equipments.

(b) Derive the formula for inductance of 3-phase line (single circuit) composed of solid conductors with unsymmetrical spacing. Assume that there is no neutral wire.

(c) (i) State the need of reactive power compensation in power system.

(ii) Obtain derivation of maximum power flow under steady state condition.

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