22529

21222

3 Hours / 70 Marks

Seat No. | | | | | | | | |

15 minutes extra for each hour

Instructions : (1) Answer each next main Question on a new page.

(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.

Marks

1. Attempt any FIVE : **10**

(a) List out the role of power system engineer in analysis of given power system.

(b) Draw neat labelled equivalent circuit of alternator.

(c) State the impact of resistance and capacitance on performance of transmission line.

(d) State the four factors that governs the skin effect in transmission line conductors.

(e) Define the generalised constant A × B refer to transmission line.

(f) Define the generalised circuit applicable to transmission line.

(g) List out any two reactive power compensating equipment used in the power system.

2. Attempt any THREE : **12**

(a) Summarise the advantages of per-unit system in power system analysis.

(b) Calculate the Self GMD and Mutual GMD for following conductors configuration.

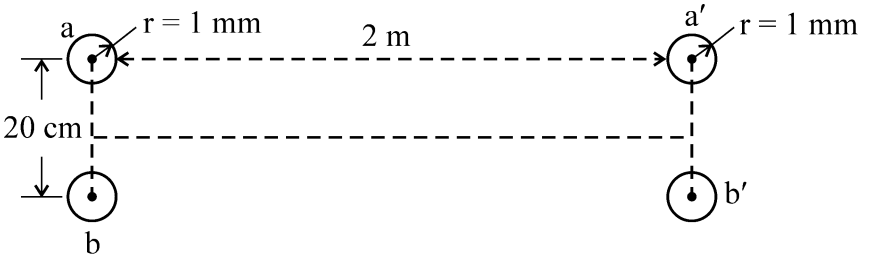

Fig. 1

(c) Determine the GCC for medium transmission line represented by 'T' network. Assume Y = total admittance / ph. & Z = total impedance / ph.

(d) Describe the benefits of generalised circuit representation of transmission line.

3. Attempt any THREE : **12**

(a) Develop reactance diagram of following power system considering generator rating as base values.

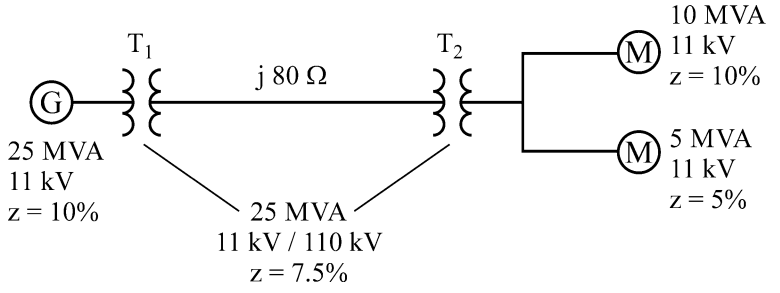

Fig. 2

(b) Develop the equation for inductance of single phase line composed of solid conductors.

(c) A three phase transmission line have total impedance (10 + j 32) ohms/ph and admittance 2.8×10^{-4} s/ph. Calculate the GCC considering 'π' network.

(d) A 220 kV transmission line has GCC as A = 0.75 $\lfloor 0.2°$, B = 110 $\lfloor 85°$ Ω. Calculate real power at unity power factor that can be delivered when voltages at both ends of the tr. line maintained constant.

4. Attempt any THREE : **12**

(a) Explain the different aspects of power system analysis.

(b) Determine the GCC – A × B for the resultant network when two generalised circuits are connected in parallel.

(c) Determine the Self GMD of following configured conductors.

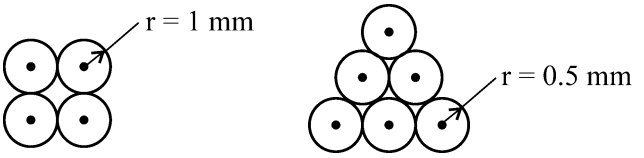

Fig. 3

(d) Develop the condition for maximum real power flow at receiving end of the transmission line.

(e) Evaluate the co-ordinates of the centre and radius of sending end circle diagram for a power system having following data :

$A = 0.96 \angle 3°$, $B = 50 \angle 73°$ Ω/ph., $V_{S_{l-l}} = 120$ kV $\angle 2°$, $V_{R_{l-l}} = 100$ kV$\angle 0°$.

5. Attempt any TWO : **12**

(a) Calculate the total capacitance of each conductor of 3.3 kV, 3 phase 50 Hz, 50 km long transmission line composed of solid conductors of 20 mm diameter and are spaced at the corners of a triangle with 3 m, 5 m, 4 m sides.

(b) Write the procedure to draw receiving end circle diagram.

(c) A three phase 220 kV transmission line has $A = D = 0.9 \angle 0.2°$, $B = 100 \angle 72°$ Ω. Determine the max. power supplied at sending end when sending end voltage is maintained at 230 kV.

6. Attempt any TWO : **12**

(a) For a generalised circuit representation of transmission line prove that :

$V_R = AV_S - BI_S$

$I_R = - CV_S + DI_S$

(b) Explain the need of reactive power compensation in power system. Suggest the suitable compensating equipment for following area :

– Load Center

– 300 km long transmission line

– Distribution substation

(c) Evaluate the real power at the sending end 3-phase transmission line having GCC – A = 0.98 $\angle 3°$ and B = 105 $\angle 72°$ Ω, Power delivered is 50,000 kVA, 132 kV, 0.85 lag p.f. Load angle is 11°.