17510

11718

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

Marks

1. A) Attempt **any three** of the following : **12**

a) Draw a single line diagram of power system.
b) Prove that in power flow equation S = VI*.
c) Compare between AC and DC resistance in power system.
d) Write advantages of generalized circuit representation.

B) Attempt **any one** of the following : **6**

a) Derive an expression for generalized circuit constants for two networks connected in series.
b) Explain the skin effect and proximity effect in transmission lines.

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

a) i) Define generalized circuit and generalized circuit constants.
ii) Write the advantages of circle diagram.

b) Determine the inductance per km of a transposed double circuit 3 ϕ line shown in Fig. 1. Each circuit of the line remains on its own side. The diameter of the conductor is 2.532 cm.

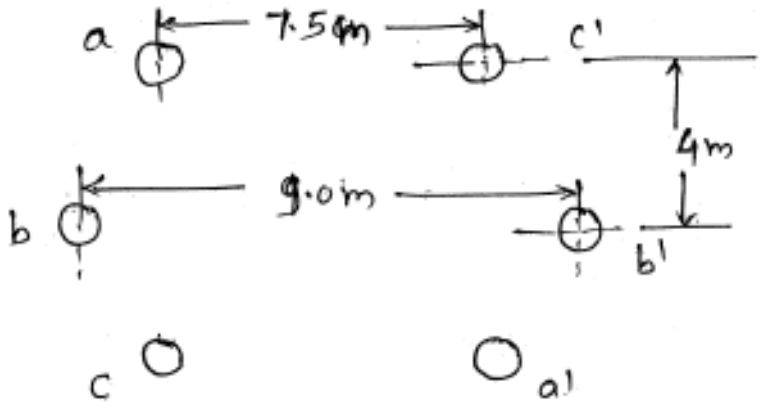

Fig. – 1

P.T.O.

Marks

c) A 3 ϕ 132 KV overhead line delivers 50 MVA at 132KV and power factor 0.8 lagging at its receiving end. The constants of the line are A = 0.98 $\angle 3^\circ$ and B = 110 $\angle 75^\circ$ Ω/phase. Find

i) Sending end voltage and power angle.

ii) Sending end active and reactive power.

iii) Capacity of static compensation equipment at the receiving end to reduce the sending end voltage to 140 KV for the same load.

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

a) Write the role of power system engineer in PS.

b) Write the steps for drawing a sending end circle diagram with neat diagram.

c) A 400 KV 3-phase bundled conductor line with two sub-conductors per phase has a horizontal configuration as shown in Fig. 2. The radius of each subconductor is 1.6 cm. Find the inductance per phase per km of the line.

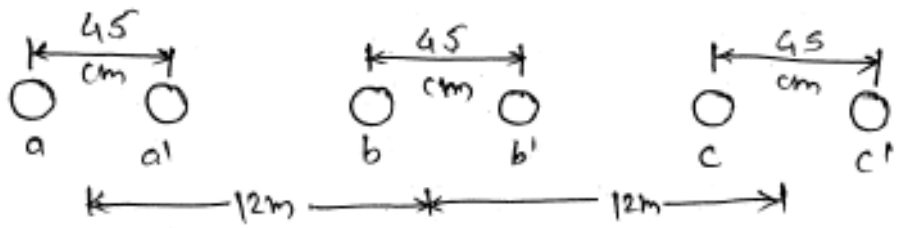

Fig. – 2

d) A 3 ϕ 132 KV line delivers 40 MVA at 0.8 P.f. lagging. The line constants are A = D = 0.98 $\angle 3^\circ$, B = 110 $\angle 75^\circ$, C = 5×10^{-4} $\angle 88^\circ$. Find the capacity of phase modifier at full load. V_s = 140 KV, V_r = 132 KV.

e) Explain the effect of earth field on transmission line capacitance.

4. A) Attempt **any three** of the following : **12**

a) Derive an expression for capacitance of two wire line.

b) A 275 KV, 3 ϕ line has the following line parameters, A = 0.93 $\angle 1.5^\circ$, B = 115 $\angle 77^\circ$. If the receiving-end voltage is 275 KV, determine the sending end voltage if the load of 250 MW at 0.85 lagging PF is being delivered at the receiving end.

c) Draw the equivalent circuit diagram of

i) Alternator ii) Transformer.

d) State the expression for complex power at receiving end of transmission line. Derive the condition for max. power at receiving end.

Marks

B) Attempt **any one** of the following. **6**

a) Explain how generalised circuit constants are measured.

b) Explain the concept self G.M.D. and mutual G.M.D. in inductance for transmission line.

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

a) A 132 KV, 50 Hz, 3 ϕ transmission line delivers a load of 50 Mw at 0.8 P.F. lagging at the receiving end. The generalized constants of the transmission line are $A = 0.85 \angle 1.6^\circ$, $B = 100 \angle 80^\circ$, $C = 0.0018 \angle 95^\circ$. Find sending end voltage, sending end current and % voltage regulation. Use nominal π method.

b) Explain why reactive power compensation is necessary. Explain working of synchronous condenser in this.

c) Find the susceptance to neutral/km of a double-circuit three phase line with transposition as shown in Fig. 3. Given D = 7 m and radius of each = 1.38 cm.

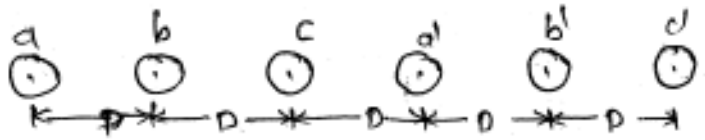

Fig. – 3

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

a) A 50 Hz, 3 ϕ, 275KV, 400 km × mission line has the following parameters : R = 0.035 Ω /km/ph, L = 1.1 mH/km/ph, C = 0.012 μF/km/ph. If the line is supplied at 275 KV, determine the MVA rating of a shunt reactor having negligible losses. The receiving end volt. is 275 KV when line is delivering no load. Use nominal π method.

b) Draw the pu impedance diagram for the P.S. shown in Fig. 4, Neglect resistance and use a base of 100 MVA, 220 KV in 50 Ω line. The ratings of the generator, motor and transformer are, generator – 40MVA, 25 KV, X = 20%, Motor = 50 MVA, 11 KV, X = 30%, Y – Y transformer = 40MVA, 30/220 KV, X = 15%, Y – Δ transformer, 30 MVA, 11/220 KV, X = 15%. Fig. 4.

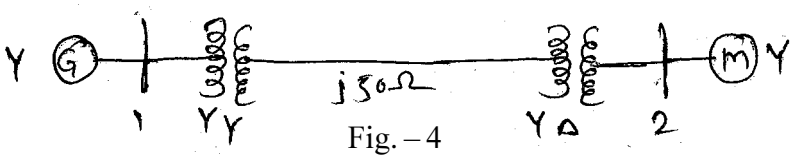

Fig. – 4

c) Derive the expression for inductance of single phase line composed of solid conductors and bundled conductors.

d) Write power flow equation in the terms of sending end and receiving end voltage.

e) A medium transmission line has series impedance is (20 +j52) Ω and shunt admittance is 316×10^{-6} S/ph. Calculate A, B, C, D constants of the line assuming nominal 'T' circuit.