ENGINEERING ACADEMY

Class Centre-Pithuwala | Karanpur; HO: Shimla bypass road near Government polytechnic Pithuwala Dehradun
Mob:08449597123,09411340612 Web: www.engineeringacademy.co.in
E-mail:engineeringacademyddn@gmail.com

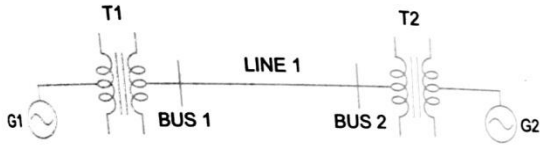
PREP. BY: R.K.RAMAN

1. A 75 MVA, 10 KV synchronous generator has X_d = 0.4 pu. The X_d value (in pu) to a base of 100 MVA , 11kV is
   a) 0.578 b) 0.279
   c) 0.412 d) 0.44

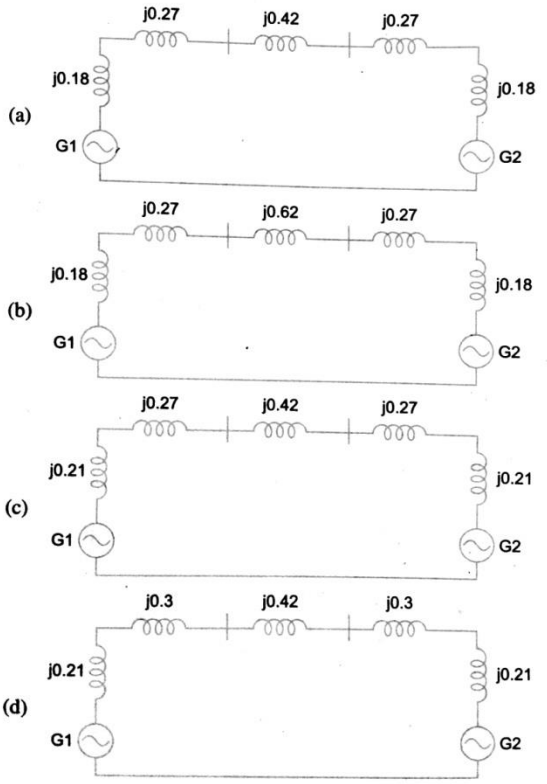
ANS: d)

2. For the power system shown in the figure below, the specifications of the components are the following

G1:25 kV, 100 MVA, X = 9 %
G2: 25 kV, 100 MVA, X = 9 %
T1: 25 kV/ 220 kV, 90 MVA , X = 12 %
T2: 25 kV/25 kV, 90 MVA , X = 12 %
Line 1: 220 kV, X = 150 ohms



Choose 25 kV as the base voltage at the generator G1, and 200 MVA as the MVA base. The impedance diagram is



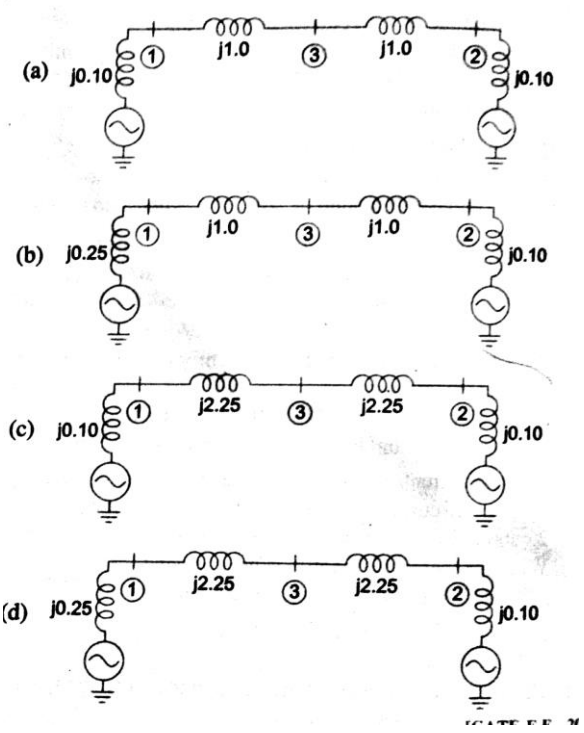
ANS: b)

3.For a power system network with n nodes, Z_{33} of its bus impedance matrix is j0.5 per unit. The voltage at node 3 is $1.3\angle -10^{o}$per unit. If a capacitor having reactance of –j3.5 per unit is now added to the network between node 3 and the reference node, the current drawn by the capacitor per unit is

a) $0.325\angle -100^{o}$
b) $0.325\angle 80^{o}$
c) $0.371\angle -100^{o}$
d) $0.433\angle 80^{o}$

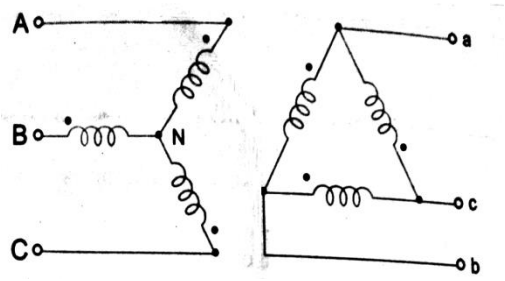
ANS: d)

4. For the above system , the positive sequence diagram with the pu values on the 100 MVA common base is



ANS: a)

5. If the star side the star- delta transformer shown in the figure is excited by a negative sequence voltage, then



a) V_{AB} leads V_{ab} by 60º
b) V_{AB} lags V_{ab} by 60º
c) V_{AB} leads V_{ab} by 30º
d) V_{AB} lags V_{ab} by 30º

ANS: d)

6. In the above system , the three- phase fault MVA at the bus 3 is

a) 82. 55 MVA b) 85. 11 MVA
c) 170. 91 MVA d) 181. 82 MVA

ANS: d)

7. A generator is connected through a 20 MVA, 13.8/ 138 kV step- down transformer, to transmission line. At the receiving end of the line a load is supplied through a step- down transformer of 10 MVA, 138/ 69 kV rating . A 0.72 pu load, evaluated on load side transformer rating as base values of MVA and 69 kV in load circuit , the value of the load (in per unit) in generator circuit will be

a) 36 b) 1.44
c) 0.72 d) 0.18

ANS: a)

8. A new generator having $E_g = 1.4 | \underline{30^o} pu$ [equivalent to (1.212 + j0.70)pu] and synchronous reactance 'X_s' of 1.0 pu on the system base, is to be connected to a bus having voltage V, in the existing power system. This existing power system can be represented by Thevenin's voltage $E_{th} = 0.9 | \underline{0^o} pu$ in series with Thevenin's impedance $Z_{th} = 0.25 | \underline{90^o} pu$. The magnitude of the bus voltage V_t of the system in pu will be

a) 0.990 b) 0.973
c) 0.963 d) 0.900

ANS: b)

9. A 3- phase generator rated at 110 MVA, 11 kV is connected through circuit breakers to a transformer . The generator is having direct axis sub- transient reactance $X''_d = 19\%$, transient reactance $X'_d = 26\%$, and synchronous reactance = 130 %. The generator is operating at no load rated voltage when a three phase short circuit fault occurs between the breakers and the transformer. The magnitude of initial symmetrical rms current in the breakers will be

a) 4.44 kA b) 22.20 kA
c) 30. 39 kA d) 38.45 kA

ANS: c)

10. For a fully transposed transmission line

a) Positive, negative and zero sequence impedances are equal
b) Positive and negative sequence impedances are equal
c) Zero and positive sequence impedance are equal
d) Negative and zero sequence impedances are equal

ANS: b)

11. In an unbalanced three- phase system, phase current $I_a = 1\angle(-90^o) pu$, negative sequence current $I_{b2} = 4\angle(-150^o) pu$, zero sequence current $I_{c0} = 3\angle(-90^o) pu$. The magnitude of phase current I_b in pu is

a) 1.00 b) 7.81
c) 11.53 d) 13.00

ANS: c)

12. For an unbalanced fault, with paths for zero – sequence currents, at the point of fault

a) The negative – and zero – sequence voltages are minimum

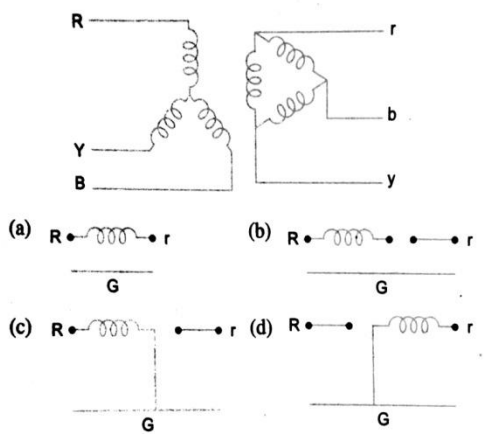
b) The negative- and zero- sequence voltages are maximum

c) The negative- sequence voltage is minimum and zero – sequence voltage is maximum

d) The negative- sequence voltage is maximum and zero- sequence voltage is minimum

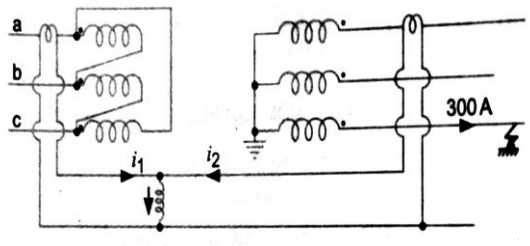
ANS: b)

13. The zero – sequence circuit of the three-phase transformer shown in the figure is



ANS: c)

14. A 3- phase transformer rated for 33 kV/ 11 kV is connected in delta/ star as shown in figure. The current transformers (CTs) on low and high voltage sides have a ratio of 500/ 5. Find the currents i_1 and i_2, if the fault current is 300 A as shown in figure .



a) $i_1 = \frac{1}{\sqrt{3}}A, i_2 = 0A$

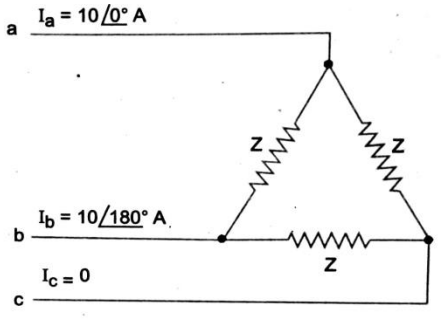
b) $i_1 = 0A, i_2 = 0A$

c) $i_1 = 0A, i_2 = \frac{1}{\sqrt{3}}A$

d) $i_1 = \frac{1}{\sqrt{3}}A, i_2 = \frac{1}{\sqrt{3}}A$

ANS: a)

15. A 3- phase transmission line supplies Δ-connected load Z. The conductor 'c' of the line develops an open circuit fault as shown in figure. The currents in the lines are as shown on the diagram. The +ve sequence current component in line 'a' will be



a) $5.78\angle -30^o$ b) $5.78\angle 90^o$

c) $56.33\angle 90^o$ d) $10.00\angle -30^o$

ANS: a)

16. The severity of line – to- ground and three-phase faults at the terminals of an unloaded synchronous generator is to be same. If the terminal voltage is 1.0 pu and $Z_1 = Z_2 = j0.1$ pu, $Z_0 = j0.05$ pu for the alternator , then the

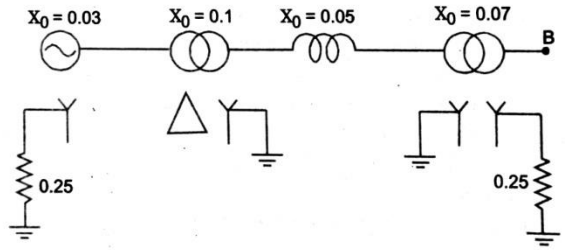
required inductive reactance for neutral grounding is

a) 0.0166pu b) 0.05 pu

c) 0.1 pu d) 0.15 pu

ANS: a)

17. A generator is connected to a transformer which feeds another transformer through a short feeder shown in the figure. The zero sequence impedance values are expressed in pu on a common base and are indicated in the figure . The Thevenin equivalent zero sequence impedance at point B is

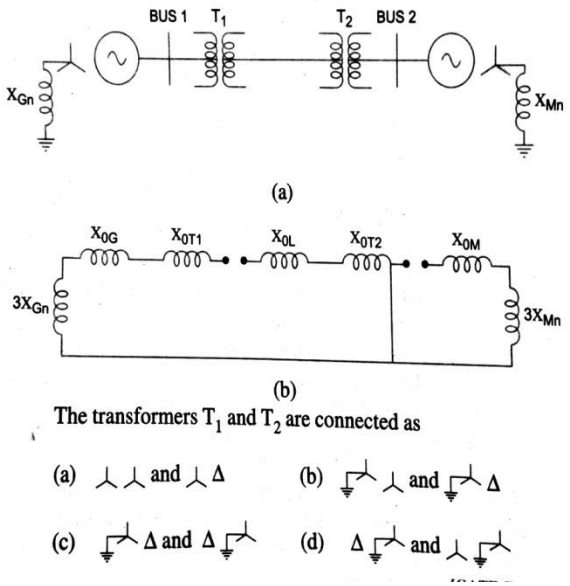


a) 0.8 + j0.6 b) 0.75 + j0.22

c) 0.75 + j0.25 d) 1.5 + j0.25

ANS: b)

18. A 2-bus system and corresponding zero sequence network are shown in the figure



ANS: b)

19. The parameters of a transposed overhead transmission line are given as :

Self reactance X_s = 0.4 Ω/ km and Mutual reactance X_m = 0.1 Ω/ km.

The positive sequence reactance X_1 and zero sequence reactance X_0, respectively, in Ω/ km are

a) 0.3 , 0.2 b) 0.5, 0.2

c) 0.5, 0.6 d) 0.3, 0.6

ANS: d)

20. A 500 MVA , 50 Hz, 3- phase turbo-generator produces power at 22 kV. Generator is Y- connected and its neutral is solidly grounded. Its sequence reactance's are $X_1 = X_2 = 0.15$ and $X_0 = 0.05$ pu . It is operating at rated voltage and disconnected from the rest of the system (no load). The magnitude of the sub- transient line current for single- line – to ground fault at the generator terminal in pu will be

a) 2.851 b) 3.333

c) 6.667 d) 8.553

ANS: d)

21. The sequence components of the fault current are as follows

$I_{positive}$ = j1.5 pu $I_{negative}$ = -j0.5 pu

I_{zero} = -j1.0 pu

The type of fault in the system is

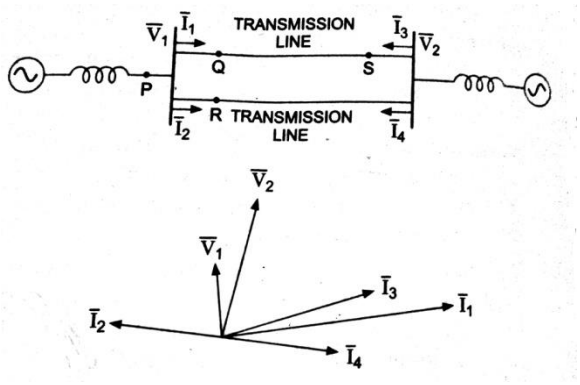
a) LG b) LL

c) LLG d) LLLG

ANS: c)

22. A sustained three- phase fault occurs in the power system shown in the figure. The current and voltage phasors during the fault (on a common reference), after the natural transients have died down, are also shown . Where is the fault located

ENGINEERING ACADEMY
Class Centre-Pithuwala | Karanpur; HO: Shimla bypass road near Government polytechnic Pithuwala Dehradun
Mob:08449597123,09411340612 Web: www.engineeringacademy.co.in
E-mail:engineeringacademyddn@gmail.com
PREP. BY: R.K.RAMAN



a) Location P b) Location Q
c) Location R d) Location S

ANS: b)

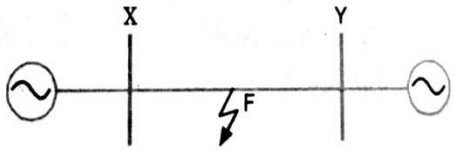
23. A 20 MVA, 6.6 kV, 3 – phase alternator is connected to a 3- phase transmission line. The per unit positive- sequence, negative- sequence and zero- sequence impedance of the alternator are j0.1 , j0.1 and j0.04 respectively. The neutral of the alternator is connected to ground through an inductive reactor of j0.05 pu . The per unit positive-, negative – and zero – sequence impedances of the transmission line are j0.1, j0.1 and j0.3, respectively . All per unit values are based on the machine ratings. A solid ground fault occurs at one phase of the far end of the transmission line. The voltage of the alternator neutral with respect to ground during the fault is

a) 513.8 V b) 889.9 V
c) 1,112.0 V d) 642.2 V

ANS: d)

24. A two – machine power system is shown . Transmission line XY has positive sequence impedance of $Z_1\Omega$ and zero sequence impedance of $Z_0\ \Omega$.

An 'a' phase to ground fault with zero fault impedance occurs at the centre of the transmission line. Bus voltage at X and line current from X to F for the phase 'a' , are given by V_a volts and I_a amperes, respectively . Then, the impedance by the ground distance relay located at the terminal X of line XY will be given by



a) $Z_1/ 2\Omega$ b) $Z_0/ 2\ \Omega$
c) $(Z_0+Z1)/2\ \Omega$ d) $V_a/ I_a\ \Omega$

ANS: d)

25. The interrupting time of a circuit breaker is the period between the instant of

a) Initiation of short circuit and the arc extinction on an opening operation
b) Energizing of the trip circuit and the arc extinction on an operation
c)Initiation of short circuit and the parting of primary arc contacts
d) Energizing of the trip circuit and the parting of primary arc contacts

ANS: b)