

Power System Analysis

Symmetrical Fault Analysis

1. Which among these is the most severe fault?
 - a. Single line to ground fault.
 - b. Double line to ground fault
 - c. Line to line fault
 - d. **Symmetrical fault.**

2. On which among the following factors does the magnitude of the fault current depend?
 - a. Total impedance upto the fault.
 - b. Voltage at the fault point
 - c. **Both (a) and (b)**
 - d. None of these

3. Which among the following methods are generally used for the calculation of symmetrical faults?
 - a. Norton theorem
 - b. Thevenin's theorem
 - c. Kirchhoff's laws
 - d. **Only (b) and (c)**
 - e. All of these

4. Symmetrical fault is the most severe fault – true

5. line to line fault is the most severe fault – false

6. Norton theorem is generally used for the calculation of symmetrical faults- true

7. Kirchhoff's law and thevenin's theorem are generally used for the calculation of symmetrical faults – true

8. Which among the following reactance have a greater value?

- a. Sub transient reactance
- b. Transient reactance
- c. **Synchronous reactance**
- d. All of these
- e. None of these

9. Synchronous reactance have a greater value than transient reactance – true

10. Synchronous reactance have a greater value than sub transient reactance – true

11. Transient reactance have a greater value than sub transient reactance- true

12. Sub Transient reactance have a greater value than transient reactance – false

13. transient reactance have a greater value than synchronous reactance – false

14. sub transient reactance have a greater value than synchronous reactance – false

15. What is the expression for the symmetrical short circuit current? If the total short circuit current consists of two parts namely symmetrical short circuit current and DC offset current.

- a. $(V_m / Z) * \sin (\omega + \alpha t - \theta)$
- b. $(V_m / Z) * \sin (\omega t + \alpha - \theta)$
- c. $(V_m * Z) * \sin (\omega t + \alpha t - \theta)$
- d. $(V / Z_m) * \sin (\omega t + \alpha - \theta)$

16. In which portion of the transmission system is the occurrence of the fault more common?

- a. Alternators
- b. Transformers
- c. **Transmission lines**
- d. Underground cables

17. Which among these is the most commonly occurring fault?

- a. Single line to ground fault.**
- b. Double line to ground fault
- c. Line to line fault
- d. Fault due to all the three phases to earth

18. Which of the following fault results into a three phase faults?

- a. Single line to ground fault.
- b. Double line to ground fault
- c. Line to line fault
- d. Fault due to all the three phases to earth.**

19. When an alternator is short circuited on the three phases, it settles down to the steady short circuit value and limited by

- a) Sub-transient reactance
- b) Transient reactance
- c) Synchronous reactance
- d) Either (a) or (c)

20. When a fault occurs in a power system, bus voltages reduces and large current flows in the lines. – true

21. The initial value of the dc component of current depends on the magnitude of the ac voltage when the circuit is closed. – true

22. At the instant prior to short circuit, the no load armature current is very small resulting negligible armature reaction effect and maximum air gap flux. – true

23. The subtransient current $|I''|$ is much larger than the steady state current $|I|$ - true
24. Symmetrical faults means fault currents are equal in all the phases and can be analyzed on per phase basis – true
25. The synchronous reactance is the ratio of induced emf and the steady state rms current – true
26. Synchronous reactance is the sum of leakage reactance and the reactance representing armature reaction. – true
27. Synchronous reactance , $X_s = X_l + X_a$.- true
28. The subtransient reactance is the ratio of induced emf on no-load and the subtransient symmetrical rms current – true
29. The sub transient reactance is the reactance of a synchronous machine under subtransient condition – true
30. The transient reactance is the ratio of induced emf on no-load and the transient symmetrical rms current. – true
31. The transient reactance is the reactance of synchronous machine under transient condition – true
32. Synchronous reactance is the reactance of a synchronous machine under steady state condition – true

33. The subtransient reactance can be used to estimate the initial value of fault current immediately on the occurrence of the fault. – true
34. The transient reactance is used to estimate the transient state fault current. – true
35. The symmetrical faults are analyzed using per unit reactance diagram of the power system. – true
36. In sub transient reactance Flux created by induced currents in the damper winding is included.- true
37. In transient reactance , there is no damper winding and hence no flux is created - true
38. Sub transient reactance is the smallest reactance among the reactance values – true
39. Synchronous reactance is the smallest reactance among the reactance values – false
40. In sub transient reactance , there is no damper winding and hence no flux is created – false
41. In transient reactance Flux created by induced currents in the damper winding is included – false
42. The symmetrical faults are analyzed using per unit resistance diagram of the power system. – false
43. The transient reactance is used to estimate the steady state fault current – false

44. When a fault occurs in a power system, bus voltages reduces and less current flows in the lines – false
45. Symmetrical faults means fault currents are unequal in all the phases and can be analyzed on per phase basis – false
46. The transient reactance is the reactance of a synchronous machine under sub transient – false
47. The sub transient reactance is the reactance of a synchronous machine under transient condition – false
48. The synchronous reactance is the reactance of a synchronous machine under subtransient condition – false
49. The fault is called symmetrical fault if the fault current is equal in all the phases. – true
50. The fault condition of a power system can be divided into subtransient, transient and steady state periods. – true

Unsymmetrical fault analysis

1. What is the value of zero sequence impedance in line to line faults?
 - a. $Z_0 = 1$
 - b. $Z_0 = \infty$
 - c. $Z_0 = 3 Z_n$
 - d. $Z_0 = 0$
2. What percentage of fault occurring in the power system is line to line fault?
 - a. 5 %
 - b. 30 %
 - c. 25 %
 - d. 15 %
3. In line to line faults, zero sequence impedance is zero – true
4. In line to line faults, zero sequence impedance is infinite – false
5. 15% of fault occurring in the power system is line to line fault – true
6. 15% of fault occurring in the power system is line to ground fault – false
7. 25% of fault occurring in the power system is line to line fault – false
8. What is the expression for fault current in line to line fault?
 - a. $I_f = \sqrt{3} * (E_a / Z_1 + Z_2)$
 - b. $I_f = 3 * (E_a / Z_1 + Z_2)$
 - c. $I_f = \sqrt{3} * (E_a / Z_1 + Z_2 + Z_0)$
 - d. $I_f = 3 * (E_a / Z_1 + Z_2 + Z_0)$
9. What will be the sum of $(I_B + I_Y)$ in case of line to line fault, if the fault is occurring in the B and Y lines?
 - a. ∞
 - b. 0
 - c. 1
 - d. I_R
10. The sum of $(I_B + I_Y)$ in case of line to line fault is zero, if the fault is occurring in the B and Y lines – true
11. The sum of $(I_B + I_Y)$ in case of line to line fault is infinite, if the fault is occurring in the B and Y lines – false

12. What happens to the value of the fault current in case of SLG fault, if fault impedance is introduced?
 - a. The fault current increase
 - b. The fault current remains same as in case of SLG fault.
 - c. The fault current becomes zero
 - d. The fault current is reduced
13. The fault current in case of SLG fault is reduced, if fault impedance is introduced – true
14. The fault current in case of SLG fault is increased, if fault impedance is introduced- false
15. What happens if the neutral is not grounded in case of the single line to ground fault?
 - a. Only the zero sequence impedance will be zero
 - b. The zero sequence impedance will be infinite
 - c. Fault current will be zero
 - d. Both (b) and (c)
 - e. All of these
16. the neutral is not grounded in case of the single line to ground fault than fault current will be zero – true
17. the neutral is not grounded in case of the single line to ground fault than fault current will be maximum – false
18. the neutral is not grounded in case of the single line to ground fault than the zero sequence impedance will be infinite - true
19. the neutral is not grounded in case of the single line to ground fault than the zero sequence impedance will be zero – false
20. What is the value of fault current I_f , in case of SLG fault?
 - a. $3 * (E_a / Z_1 + Z_2 + Z_0)$
 - b. $2 * (E_a / Z_1 + Z_0)$
 - c. $3 * (E_a / Z_1 + Z_2)$
 - d. $2 * (E_a / Z_1 + Z_2 + Z_0)$
21. The value of fault current I_f , in case of SLG fault is $3 * (E_a / Z_1 + Z_2 + Z_0) .$ – true
22. The value of fault current I_f , in case of SLG fault is $2 * (E_a / Z_1 + Z_2 + Z_0) .$ – falsw

23. What are the terminal conditions in case of SLG fault, if the fault occurs in the phase A?
- a.** $V_b = 0, I_a = 0, I_c = 0$
 - b.** $V_a = 0, I_b = 0, I_c = 0$
 - c.** $V_a = 0, I_a = 0, I_c = 0$
 - d.** $V_b = 0, I_a = 0, I_b = 0$
24. What are cross country faults?
- a.** A fault occurring at any point of the power system
 - b.** Two or more faults occurring simultaneously on the power system
 - c.** Line to line fault
 - d.** All of these
 - e.** None of these
25. Two or more faults occurring simultaneously on the power system is called cross country faults – true
26. Two or more faults occurring simultaneously on the power system is called line to line faults – false
27. What percentage of faults occurring is single line to ground fault?
- a.** 50 %
 - b.** 60 %
 - c.** 35 %
 - d.** 70 %
28. 70% of faults occurring is single line to ground fault – true
29. 35% of faults occurring is single line to ground fault – false
30. 70% of faults occurring is double line to ground fault – false
31. What are the types of unsymmetrical faults?
- a.** Single line to ground fault
 - b.** Double line to ground fault
 - c.** Line to line fault
 - d.** All of these

e. None of these

32. Line to line fault is called unsymmetrical faults – true

33. Double line to ground fault is called unsymmetrical faults – true

34. Single line to ground fault is called unsymmetrical faults – true

35. LLG is called unsymmetrical faults – false

36. The most severe unsymmetrical fault is double line to ground fault – true

37. Unsymmetrical faults introduce unbalance in the system. – true

38. Unsymmetrical faults indicate abnormal conditions in the system – true

39. Unsymmetrical faults are more frequent than symmetrical faults. – true

40. Symmetrical faults are more frequent than unsymmetrical faults – false

41. Unsymmetrical faults introduce balance in the system – false

42. Various power system faults in increasing order of severity are

a) LG,LL,LLG,LLLG

b) LLLG,LLG,LG,LL

c) LLG,LLLG,LL,LG

d) LL,LG,LLLG,LLG

43. In which of the following given faults, all the sequence currents are equal?

LG LLG LLL LL

44. If all the sequence voltages at the fault point in a power system are equal, then the fault point is a
LLG

45. In unsymmetrical fault, the generated e.m.f. system is of positive sequence only.- true

46. In unsymmetrical fault, the generated e.m.f. system is of negative sequence only- false

47. In unsymmetrical fault, load currents are neglected. – true

48. In unsymmetrical fault, the impedance of the fault is zero.- true

49. In unsymmetrical fault, the impedance of the fault is infinite – false

50. In unsymmetrical fault, load currents are not neglected – false