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Relay Training Center Test

1. Z = 47.5 ohms @ 75 degrees, CTR = 200:5, PTR = 600:1

    A.Convert Z primary to Z secondary
    B.Convert Z to R + jX components

2. R = 18.5, X = 27

    A.Find Z
    B.Find Z angle

3. Which quadrant represents real and reactive power out of the system?

4. Which quadrant represents real and reactive power in to the system?

5. Draw a phasor diagram showing A, B & C voltages in a normal unfaulted system.

6. Define:

    A.Scalar
    B.Vector
    C.Phasor

7. Calculate VAB if:

    A.VA = 67 @ 0 degrees, VB = 67 @ -120 degrees
    B.VA = 67 @ 0 degrees, VB = 40 @ -120 degrees
    C.VA = 40 @ 0 degrees, VB = 40 @ - 100 degrees

8. Calculate VBC if:

    A.VB = 67 @ -120 degrees, VC = 67 @ -240 degrees
    B.VB = 67 @ -120 degrees, VC = 40 @ -240 degrees
    C.VB = 40 @ -140 degrees, VC = 40 @ -220 degrees

9. Calculate IAB if:

    A.IA = 5 @ -10 degrees, IB = 5 @ -130 degrees
    B.IA = 5 @ -30 degrees, IB = 5 @ -210 degrees

10. With VA = 67 @ 0, VB = 67 @ -120, VC = 67 @ -240, IA = 5 @ -10, IB = 5 @ -130, IC = 5 @ -250:

A. Calculate apparent power
B. Calculate reactive power
C. Calculate real power
D. Calculate load angle
E. Calculate power factor
F. Into which quadrant of the power quadrant does this system fall.

11. Name two factors that can change the impedance of a power line.

12. How much secondary power is flowing if a KWH meter spins 10 revolutions in 62.5 seconds, (with Kh=1.8)?

13. How much primary power is flowing in the example meter from question 12 with a PTR of 600:1 and a CTR of 600:5?

14. Given the same secondary power from question 12 and the same instrument transformer ratios of question 13, what is the output DC voltage for a 3-element watts transducer with 0-1 mA range into a 5K Ohm load and 500 watts per element?

15. Name the 3 symmetrical components in a 3-phase power system.

16. What symmetrical components exist in a 3-phase fault?

17. What symmetrical components exist in a phase to phase fault?

18. What symmetrical components exist in a phase to ground fault?

19. Calculate the current symmetrical components existing in the system example of question 10.

20. Calculate the voltage symmetrical components existing in the system example of question 10.

21. Draw a CT circuit that allows for the easy measuring of zero-sequence current.

22. Draw a PT circuit that allows for the easy measuring of zero-sequence voltage.

23. Calculate negative sequence voltage for a system that has:

VA = 0 volts, VB =67 volts @ -120 degrees, VC =67 volts @ -240 degrees

24. Why is zero sequence compensation necessary?

25. Why might you force neutral current?

26. What precautions should one take prior to forcing neutral current?

27. What is the IR in the system example of question 10?

28. What is the IR in the system example of question 10 if you short out IA?

29. What is the IR in the system example of question 10 if you short out IB?

30. What is the IR in the system example of question 10 if you short out IC?

31. What is the IR in the system example of question 10 if you short out IB and IC?

32. Is a relay angle of (lag) 60 degrees generally considered to be a forward or reverse reach?

33. Draw an impedance diagram showing the origin and the fault plot for a fault occurring at 5 ohms @ 60 degrees. Are watts and vars entering or leaving this system?

34. Calculate the impedance of a B-C fault with VA= 67.6 volts @ 0, VB= 35 volts @ -165 degrees, VC=35 volts @ -195 degrees, IA = 0, IB = 10 amps @ -150 degrees, IC = 10 amps @ -330 degrees.

35. How much ground current is flowing in the system example of question 34?

36. Is the system example of question 34 representative of a phase-to-phase forward or reverse fault?

37. Will a directional ground over-current relay pick-up for the system example of question 34? Can a phase-to-phase relay pick up for a phase-to-ground fault?

38. What symmetrical components exist in a relay if the wiring to the relay is inadvertently rolled, with B & C phases swapped, in a normal 3-phase balanced system? With A & B phases swapped? C & A?

39. How can one detect an unwanted ground connected at the neutral node, before the ground current relay, of a 3-phase wye configured CT circuit? Why would you want to?