



Answer the following questions

Ques. 1:

An 11 kV overhead distribution feeders. The substation transformer is a 25 MVA, 66/11 kV three-phase transformer. The parameters of the overhead feeder are given in Table 1. The reactance of the substation transformer referred to 11 kV side is 0.3 Ω. The equivalent reactance of the system behind substation referred to 11 kV side is 0.5Ω. The voltage of the busbar A that is closed to the secondary side of the substation transformer was 10.9 kV before the fault occurrence. Considering the applied protective devices are an over current relay installed at the secondary side of the substation transformer, a reclosure installed at 13 km distance from the substation transformer, and a fuse installed at 12 km distance from the reclosure, **calculate the settings of each protective device associated with the phase faults and that associated with ground fault.**

where:

The used fuse is 100 A and its total clearing time's (t_{fuse}) equation is:

$$t_{fuse} = 45.68 e^{(-0.006984 \times I_{fus})} + 1.681 e^{(-0.00145 \times I_{fus})}$$

- The pick up current of the reclosure and the over current relay are 300 A and 400 A , respectively.

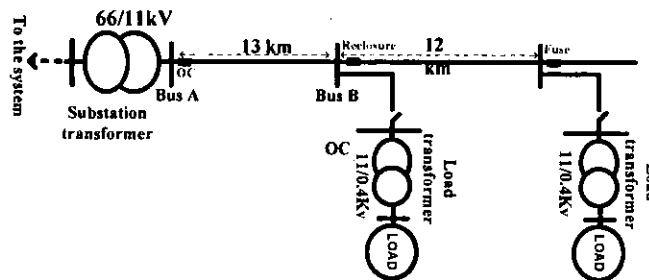


Fig.1. A distribution Feeder protected by over current relay, reclosure, and fuse.

Table 1

Symbol	Quantity	Overhead	Unit
R_1	Positive sequence resistance	0.194	(Ω/ km)
R_0	Zero sequence resistance	0.3	(Ω/km)
L_1	Positive sequence inductance	1.78	(mH/km)
L_0	zero sequence inductance	6.1	(mH/km)
C_1	Positive sequence capacitance	0.015	(μF/km)
C_0	zero sequence capacitance	0.0049	(μF/km)

Ques. 2:

Illustrate the negative effect of distributed generation unit insertion on the conventional coordination of reclosure-fuse in a medium voltage distribution feeder. The answer should cover the effect of the location and contribution level of distributed generation unit. Also, illustrate at least three advanced methods published in three international publications to mitigate these problems.

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