SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19EE605 PROTECTION AND SWITCHGEAR

III YEAR /VI SEMESTER

Unit 1- PROTECTION SCHEMES

Topic: Types of Faults

TYPES OF FAULTS

Two classifications of faults are

(i) Symmetrical faults
(ii) Unsymmetrical faults

Symmetrical Faults

- A three-phase fault is called a symmetrical type of fault.
- In a 3-ph fault, all the three phases are short circuited.
- There may be two situations—all the three phases may be short circuited to the ground or they may be short-circuited without involving the ground.
- A 3-ph short circuit is generally treated as a standard fault to determine the system fault level.

Unsymmetrical Faults

- Single-phase to ground, two-phase to ground, phase-to-phase short circuits; single phase open circuit and two-phase open circuit are unsymmetrical types of faults.

Unsymmetrical Faults

Single-phase to Ground (L-G) Fault

- A short circuit between any one of the phase conductors and earth is called a single phase to ground fault.
- It may be due to the failure of the insulation between a phase conductor and the earth, or due to phase conductor breaking and falling to the ground.

Two-phase to Ground (2L-G) Fault

- A short circuit between any two phases and the earth is called a double line to ground or a two-phase to ground fault.

Phase-to-Phase (L-L) Fault

- A short circuit between any two phases is called a line to line or phase-to-phase fault.

Unsymmetrical Faults

Open-circuited Phases

- This type of fault is caused by a break in the conducting path.
- Such faults occur when one or more phase conductors break or a cable joint or a joint on the overhead lines fails.
- Such situations may also arise when circuit breakers or isolators open but fail to close one or more phases.

Winding Faults

- All types of faults discussed above also occur on the alternator, motor and transformer windings.
- In addition to these types of faults, there is one more type of fault, namely the short circuiting of turns which occurs on machine windings.

Simultaneous Faults

- Two or more faults occurring simultaneously on a system are known as multiple or simultaneous faults.
- In simultaneous faults, the same or different types of faults may occur at the same or different points of the system.

FAULT STATISTICS

Percentage Distribution of Faults in Various Elements of a Power System

Element	**% of Total Faults**
Overhead Lines	50
Underground Cables	9
Transformers	10
Generators	7
Switchgears	12
CTs, VTs, Relays Control Equipment, etc.	12

FAULT STATISTICS

Frequency of Occurrence of Different Types of Faults on Overhead Lines

Types of Faults	Fault Symbol	% of Total Faults
Line to Ground	L-G	85
Line to Line	L-L	8
Double Line to Ground	2L-G	5
Three Phase	3-Ø	2

Assessment

1. Possible faults may occur on a transmission lines are

(i) 3 phase fault (ii) L-L-G fault (iii) L-L fault (iv) L-G fault

The decreasing order of severity of the faults from the stabil

a) 1-2-3-4..

b) 1-4-3-2

c) 1-3-2-4

d) 1-3-4-2

References

1. SuniS Rao, “Switchgear, Protection and Power System (Theory, Practice & Solved Problems)”, Khanna Publishers, New Delhi, 2019.

2. Paithankar Y G, Bhide S R, “Fundamentals of Power System Protection”, Prentice Hall of India Pvt Ltd., New Delhi, 2nd Edition, 2014.

3. Badriram, Vishwakarma B.H, “Power System Protection and Switchgear”, New Age International Pvt Ltd Publishers, 2nd Edition 2017.

Thank You