Assignment 8

Due on 2023-11-11, 23:59:59 IST

1. High voltage and low voltage CT ratios are 2:1 and 5:2 respectively. Calculate the percentage error due to CT ratio mismatch.

(A) 10% (B) 12% (C) 15% (D) 20%

2. A transformer differential relay uses the relations \( I_{1L} = I_{[L]1} \) for vector group adaption, where \( I_{1L} \) represents the phase current after vector adaptation and zero sequence elimination respectively. Determine the per cent vector adaption error \( K_{[L]} \) for a transformer connection of Yd-11.

\[
\begin{bmatrix}
0.066 & -0.066 & 0 \\
-0.066 & 0 & 0.066 \\
0 & 0.066 & -0.066
\end{bmatrix}
\]

(A) 11% (B) 12% (C) 13% (D) 14%

3. A transformer differential relay observes the presence of \( I_{y2} \), \( I_{y4} \) and \( I_{y6} \) harmonic components as 0%, 0% and 5% respectively. Identify the fundamental component for the differential relay. State whether this condition indicates which of the following situations?

(A) Branch (B) Overexcitation (C) High loading (D) CT saturation

4. Differential current observed by a transformer differential relay for four different conditions are shown below. Identify the case indicating a CT saturation situation.

5. Which of the following schemes are not used for zero phase blocking of transformer differential relay in case of zero sequence?

(A) \( I_{\text{ref}} < I_{\text{set}} \) (B) \( I_{\text{ref}} = I_{\text{set}} \) (C) \( I_{\text{ref}} > I_{\text{set}} \) (D) Averaging

6. A 230 kV, 315 kV, 93 kV transformer is protected by negative sequence directional relay. Both side negative sequence currents are sensed by the relay (after normalization and phase shift compensation) and provided to Table 1 for two different situations. Identify the fault situation (internal and external) for both the cases.

<table>
<thead>
<tr>
<th>Case</th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case I</td>
<td>( 0.9 \Delta, 0.1 Y )</td>
<td>( 0.3 \Delta, 0.7 Y )</td>
</tr>
<tr>
<td>Case II</td>
<td>( 0.6 \Delta, 0.4 Y )</td>
<td>( 0.4 \Delta, 0.6 Y )</td>
</tr>
</tbody>
</table>

7. A differential relay protecting a transformer with YD (type connection) (rare side grounded) is set to operate for 5% of the normal current. Calculate the percentage of winding at one connected side of the transformer saturated by the relay.

(A) 12% (B) 15% (C) 20% (D) 25%