

Assignment - 3

HINTS:-

* Short circuit capacity \Rightarrow Helps to get the value of transmission line impedance.

eg:- 11kV; 50Hz; 3-phase; short circuit capacity of 20MVA at 0 lag pf.

$$S = \sqrt{3} V I. \quad S = \frac{V^2}{Z} \text{ [per phase]}$$

$$\Rightarrow Z = \frac{(11/\sqrt{3})^2 \text{ kV}}{20 \text{ MVA}}$$

$$= \underline{\underline{0.002 \Omega}}$$

Mentioned 0 pf lag.

$$\Rightarrow Z = j0.002 \Omega = \underline{\underline{X_L}}$$

Convert to P.U. if required.

1)

a) Reactive power = $\sqrt{3} V I \sin \phi$.

$\phi = 90^\circ \Rightarrow$ Capacitive; $\phi = -90^\circ$ inductive.

or

Reactive rating of FC \Rightarrow Same as the Capacitive reactive power compensation.

Reactive rating of TCR \Rightarrow Rating of FC + Rating of inductive compensation

* Find I.

* Use $V \& I$ to find Z. \Rightarrow either Capacitive or inductive.

* Use wisely the information \Rightarrow delta connected.

- b) Find reactive part of load current such that
- * the compensation is full inductive and terminal voltage is 11 kV. [Thevenin voltage is 11.4 kV].
 - * the compensation is fully capacitive and terminal voltage is 11 kV [Thevenin voltage is 11.4 kV].
- c) Repeat (b); but thevenin voltage is 11 kV.
- d) Repeat (b); but thevenin voltage is 10.4 kV.
- e) Direct question \Rightarrow use relation for TCR current \Rightarrow α' included.

2) Each TSC unit = $\frac{\text{Capacitive compensation required}}{4}$.

TCR unit = Inductive compensation required.

Series reactor for capacitor \Rightarrow resonant frequency
 $= 5^{\text{th}}$ harmonics.

Use wisely the information \Rightarrow delta connected.

3) Direct problem \Rightarrow Refer to page 9 in the document for SVC control.

In the example, permitted variation in bus voltage is given. Against the variation, need to find the rating.

Here, rating is given. Variation in bus voltage is to be calculated.

- 4) Direct question; Some simulation will be required.
- 5) Direct question for controller design.