

- (b) Consider the equivalent circuit diagram of SVC as shown in fig.1.

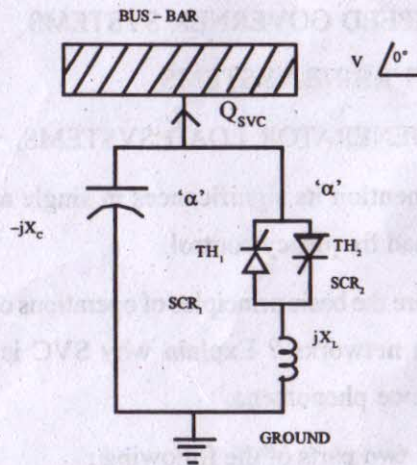


Figure.1. SVC structure

- Determine the value of reactive power (Q_{SVC}) support by SVC in system. When both SCR_1 , and SCR_2 are fired by ' α ' angle delay ?
- (c) What are the operational features of "STATCOM" in power system networks ? What are the advantages of STATCOM over SVC ? Explain its limitations.

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2729

Roll No.

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B.Tech.

(SEM. VII) ODD SEMESTER THEORY
EXAMINATION 2013-14

POWER SYSTEM OPERATION AND CONTROL

Time : 3 Hours

Total Marks : 100

Note :—Attempt all questions. Each question carries equal marks.

- Answer any two parts of the following : (2×10=20)
 - What do you mean by "VOLTAGE COLLAPSE" in power system environments ? What are the conventional methods for prevention from voltage collapse in power system environments ?
 - What do you mean by "SCADA" systems ? Differentiate "SCADA" and "PMUs". What are the special features of "PMUs" as compared to "SCADA" ?
 - What are the various stages of operation of Power Systems ? Explain in detail.
- Answer any two parts of the following : (2×10=20)
 - What do you mean by "equality and "un-equality" constraints of economic load dispatch in power systems ? What are the significances of 'PENALTY FACTOR' in economic load dispatch in power systems ?

- (b) For a certain generating unit of a thermal power plant the fuel input in millions of kilocalories per hour can be expressed as a function of power P_G in megawatts by the equation :

$$0.0001 P_G^3 + 0.03 P_G^2 + 12.00 P_G + 150.$$

Find the expression for incremental fuel cost in rupees per megawatt hour as a function of power output in megawatts. Also find a good linear approximation to the incremental fuel cost as a function of P_G .

Given : Fuel cost is Rs. 2/million kilocalories.

- (c) Define the following :

- (i) FACTS
- (ii) FACTS CONTROLLERS
- (iii) FC-TCR
- (iv) S³C
- (v) STATCON
- (vi) UPFC
- (vii) IPFC
- (viii) HPFC.

3. Answer any two parts of the following : (2×10=20)

- (a) What do you mean by "SINGLE AREA LOAD FREQUENCY CONTROL" and "DOUBLE AREA LOAD FREQUENCY CONTROL" with the help of suitable block diagrams ? Explain in detail.

- (b) Develop the mathematical model of following :

- (i) SPEED GOVERNER SYSTEMS
- (ii) TURBINE SYSTEMS
- (iii) GENERATOR LOAD SYSTEMS.

Also mention its significances in single area and double area load frequency control.

- (c) What are the basic principles of operations of SVC in power system networks ? Explain why SVC is not free from resonance phenomena.

4. Answer any two parts of the following : (2×10=20)

- (a) What are the methods of voltage control and reactive power control in power system networks ? Explain in brief.

- (b) Explain the following :

- (i) IEEE – excitation systems
- (ii) SMES – FACTS Controllers
- (iii) BESS – FACTS Controllers.

- (c) Write short notes on the following :

- (i) STATE ESTIMATIONS
- (ii) POWER SYSTEM SECURITY.

5. Answer any two parts of the following : (2×10=20)

- (a) Explain the equivalent diagram of T.C.S.C. What are the advantages and disadvantages of T.C.S.C. in power system networks ?