1079

M.E. Electrical Engineering (Power Systems)
Third Semester
EE-8304 : Flexible AC Transmission Systems (FACTS)

Time allowed: 3 Hours   Max. Marks: 50

NOTE: Attempt <u>any five</u> questions. Assume suitable missing data, if any.

x-x-x

I. a) Explain the working of a phase-shifting transformer with the help of its schematic and phasor diagram.

    b) With the help of suitable diagrams explain the working of load frequency control (LFC) and automatic generation control (AGC) of a synchronous generator.   (5,5)

II. a) How TCI-FC (thyristor controlled inductor-fixed capacitor) arrangement will behave, when load on the transmission line suddenly changes from light to heavy load? Explain its working on V-I characteristics.

    b) A single phase inductive load of 100 KW +j50 KVAr is supplied from 11KV, 50 Hz source. The static VAr compensator (SVC) has fixed capacitors of rating 100 KVAr whereas thyristor controlled inductor (TCI) can draw a maximum of 100 KVAr. For raising the system power factor to unity, find the firing angle delay of TCI and its effective inductance.   (4,6)

III. Analyse the thyristor-controlled-switched-capacitor (TCSC) in vernier-control mode. And, hence develop the relationship between inductive reactance ,X_{TCSC} vs firing angle, α.   (10)

IV. a) With the help of 2-axis theory develop the steady-state model of static compensator (STATCOM).
     b) Also, draw the variations of various developed variables vs angle (p, where (p is the angle between grid voltage and STATCOM voltage.   (8,2)

V.   Explain the working of SSSC along with its control circuitry. Elaborate your answer with the help of a suitable sample power system.   (10)

VI. How the power transfer capability of a sample power station can be improved by using a UPFC? Also, mention the specifications of the sample power system.   (10)

VII. A voltage controller with 2-stage sequence control is implemented on thyristor-controlled voltage- regulator (TCVR). Develop the expression for rms value of output voltage V_{or}, output rms current, I_{or}, rms current rating of upper and lower secondary currents of the transformer, I_1 and I_2 respectively. The load is resistive in nature.

(4x2½)

VIII. Write short notes on the following:-
    a)   Surge impedance loading (SIL)
    b)   IPFC   .

(2x5)

x-x-x