Printed Pages : 4   **TEE703**

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

PAPER ID : 0676   Roll No. [ ][ ][ ][ ][ ][ ][ ][ ][ ]

B. Tech.

(SEM. VIII) THEORY EXAMINATION 2010-11

POWER SYSTEM OPERATION & CONTROL

Time : 3 Hours   *Total Marks : 100*

Note :— (1)   Attempt ALL the questions.

       (2)   All questions carry equal marks.

1. Attempt any **FOUR** parts of the following :—   5×4=20

  (a) Discuss the structure of power system networks. Also explain the limitations of power system networks.

  (b) What do you understand by "SCADA" system ? Also mention its advantages/disadvantages.

  (c) What do you mean by "Real Time Computer Control" and "Power System Control Center" in power system environments ? Explain in brief.

  (d) What are the various operational stages of power system networks ? Explain in detail.

  (e) Explain the following :—

      (i)   ROTOR ANGLE STABILITY.

      (ii) VOLTAGE STABILITY.

      Also mention the significances of above (i) and (ii) terms in power system environments.

  (f) What do you mean by LEVEL DECOMPOSITION in power system networks ? Also mention its importances.

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2. Attempt TWO parts of the following :—   10×2=20

(a) Explain the equality and unequality constraints in economic operation of power systems. Also discuss the input-output characteristics of thermal and hydro plants.

(b) What do you mean by "PENALTY FACTOR" in economic dispatch ? Also mention its importance in economic operation of the power system environments.

(c) The fuel inputs to two plants are given by :

$$F_1 = 0 \cdot 015 \ P_1^2 + 16P_1 + 50$$
$$F_2 = 0 \cdot 025 \ P_2^2 + 12P_2 + 30.$$

The loss coefficients of the system are given by :

$$B_{11} = 0 \cdot 005; \quad B_{12} = -0 \cdot 0012 \quad \text{and}$$
$$B_{22} = 0 \cdot 002.$$

The load to be met is 200 MW, determine the economic operating schedule and corresponding cost of generation if :

(i) The transmission line losses are coordinated.

(ii) The losses are included but not coordinated.

3. Attempt TWO parts of the following :—   10×2=20

(a) Draw and explain the block diagram of Load Frequency Control of single area system. Also determine the steady state and dynamic response of single area system.

(b) Draw and explain the block diagram of Load Frequency Control of two area system. Also determine the steady state and dynamic response of two area system.

(c) What do you mean by "LOAD FREQUENCY CONTROL" in power system environments ? Also mention its merits/demerits. Develop the Mathematical model of Turbine Speed Governing System.

4. Attempt **TWO** parts of the following :—   10×2=20

(a) What are the different classical methods for voltage control in power system networks ? Explain any two methods for voltage control in power system networks.

(b) Draw and explain the schematic block diagram of different types of excitation systems and their controllers. Also mention their comparative charts.

(c) Explain the following :—

   (i)   SHUNT COMPENSATION

   (ii) PHASE ANGLE COMPENSATION.

5. Attempt **TWO** parts of the following :—   10×2=20

(a) Write short notes on the following :—

   (i)   State Estimation

   (ii) FACTS Technology.

(b) Explain the structure details and working principle of following FACTS controllers :

   (i)   FC-TCR

   (ii) STATCON

   Also mention the merits/demerits of above (i). and (ii).

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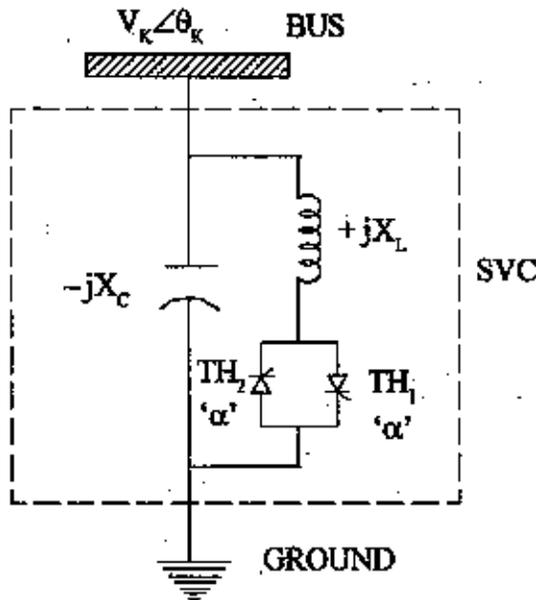(c) Consider the equivalent circuits of SVC shown in Fig. 1 :

Fig. 1 SVC Structure

Where   'α' = Firing angle of TH$_1$ and TH$_2$ Thyristors.

$- jX_C$ = Reactance of fixed capacitor

$+ jX_L$ = Reactance of thyristor controlled reactor.

(i) Determine the equivalent susceptance offered (Bea)$_{svc}$ by SVC structure i.e. shown in Fig. 1.

(ii) If bus voltage is $V_K \angle \theta_K$, what should be the values of reactive power (absorb/deliver) to the bus ?