Electrical Engineering Department

EE453N/EEL797 Power System Dynamics

Major Test

Time allowed- 2 hour Maximum Marks-50

Answer all questions

Q.1

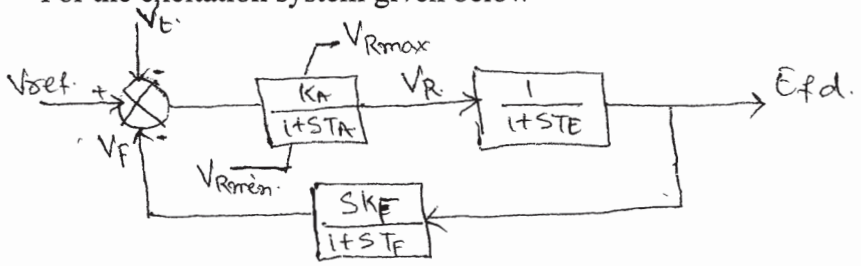
Explain the procedure of writing the multi-machine stability analysis programme with detail mathematics involved during axis transformation. Marks=10

Q.2.

A synchronous generator is delivering 1.0 p.u. power at 0.9 pf (lagging) through a circuit breaker to an infinite bus having á voltage of 1.0 p.u. If the circuit breaker is opened, how long may it be kept open before being closed without loss of synchronism? Assume X'_d=0.17; H=3.0 sec and f=50 Hz. Marks=06

Q.3.

For the excitation system given below



a. Write the state equations Marks = 3

b. If in steady state, E_{fd} = 2.5, V_t = 1.0, Find the equilibrium values of the state variables and $V_{ref.}$. Marks = 4

c. If there is a step decrease in V_t by 0.1 pu, obtain the response of E_{fd} as a function of time. Assume the following Data $T_A = 0.02$, $T_E = 0.8$, $T_F = 1.0$, $K_A = 400$, $K_F = 0.03$ Marks = 5
$V_{Rmax} = 4.0$ $V_{Rmin} = -4.0$

Q.4.

Derive the relationship between states, eigenvalues, right and left eigenvectors, and the initial condition of states. Marks = 5

State the significance of left and right eigenvector? Marks = 2

What is participation factor and how it is calculated? Marks= 2

Q.5. Discuss briefly on the following

Working of PSS along with the necessity of washout and lead block in it. Discuss also about the effect of gain of AVR and PSS in the damping performance. Marks= 7

i. Phillips-Heffron or $K_1 - K_6$ model for stability analysis Marks= 6