2063
M.E. Electrical Engineering (Power Systems)
Second Semester
EE-8201: Power Systems Dynamics and Stability

Time allowed: 3 Hours

Max. Marks: 50

**NOTE:** *Attempt any five questions.*

x-x-x

| | | |
|---|---|---|
| I. | Derive the expression for electrical power interchange of a two-machine system connected through a line having reactance X. One of the machines is generating, and the other is motoring. | 10 |
| II. | A power deficient area receives 50 MW over a tie line from another area. The maximum steady-state capacity of the tie line is 100 MW. Find the allowable sudden load that can be switched on without loss of stability. | 10 |
| III. | A 50 Hz synchronous generator with inertia constant H= 2.5s and a transient reactance of 0.20 pu feed 0.80 pu active power into an infinite bus (voltage 1 pu) at 0.8 lagging power factor via a network with an equivalent reactance of 0.25 pu. A three-phase fault is sustained for 150 ms across the generator terminals. Determine through swing curve calculation the torque angle $\delta$, 250 ms, after fault initiation. | 10 |
| IV. | A single machine is connected to a load centre through a transmission line, as shown in Fig. The load centre is represented by a reactance connected to an infinite bus. The generator initially operates with $P_e$ = 1.0 p.u, and the magnitude of voltages $V_1$ and $V_2$ are 1.0 p.u each. Find the maximum step increase in the mechanical power that will not cause transient instability. Use equal Area criterion. <br><br> Assume: $X_g$ = 0.3, $x_t$ = 0.1, x= 0.4, $x_2$ = 0.1 | 10 |

P.T.O.
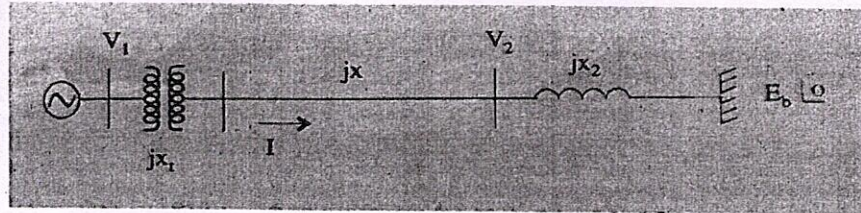
| V. | What is the effect of Excitation system on the small signal stability performance of Single Machine Infinite Bus system? Explain with block diagram. | 10 |
|---|---|---|
| VI. | a) Explain the small signal stability of a multi-machine system.<br><br>b) Explain the role of Power System stabilizers (P.S.S) in the power system. | 5,5 |
| VII | A 150 km 440 kV line has a series reactance of 0.30 ohm/km, and the power transmitted is 800 MW. It is connected to a source bus which has a short-circuit capacity of 4000 MW. Calculate the source voltage when the load is disconnected to (i) unity (ii) 0.9 lag | 10 |
| VIII | a) Describe how Reactive power compensating devices influence voltage stability.<br><br>b) Find the capacity of a static VAR compensator to be installed at a bus with ±6 % voltage fluctuations. The short circuit capacity is 5000 MVA. | 5, 5 |