MOTILAL NEHRU NATIONAL INSTITUTE OF TECHNOLOGY

Power System-II

End Semester Examination

Subject Code: EE1503 B.Tech ( V$^{th}$ sem.)

Max. Marks: 60 Time: 3hrs

(Each question carries equal Marks)

1. (a) Discuss the phenomena of short circuit analysis of a sychronous generator under no load condition. Draw the approximate model of the circuit with different period under analysis and reactance presented by the machine with mathematical expression. From the envelope of the short circuit current correlate the current profile in different period of analysis.

(b). For the radial network as shown in the figure a three phase fault occurs at F. Determine the fault current and line voltage at 11 KV bus under fault condition.

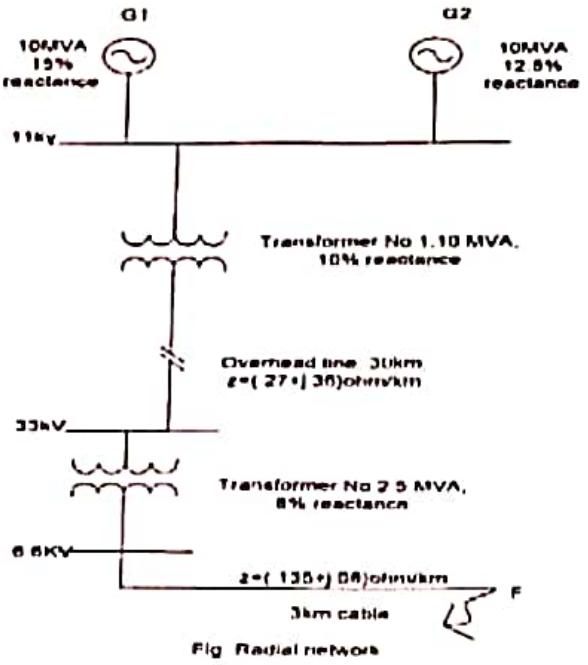

Fig Radial network

2. (a) What is the significance of symmetrical component in power system. Assuming no mutual coupling exits between the sequence networks obtain the expression of sequence component of the voltage in a general power network and neat sketch of its thevenin equivalent. For double line to ground fault with fault impendence zf in transmission network find out the expression of sequence component of currents with necessary mathematical formulations.

(b). Balanced 3-phase star load supplied from 3-phase unbalanced supply. Three identical resistors are star-connected and rated for 2,300 volts, 500 kVA as a 3-phase unit. The neutral point is not available. This resistor unit is connected to an unsymmetrical 3-phase system whose line voltage are $E_A$=2,760<0 volts, $E_B$=2300<-138.6 volts, $E_C$= 1840<124.2 volts. Find the current in each line by the method of symmetrical components.

3. (a) What are the basic features being considered in the context of dynamics of a power system. If two finite machines are connected though line having reactance $X_e$ obtain the expression of swing equation and electrical power interchange between two machines.

(b). The generator is delivering 1 p.u. power to the infinite bus(|V|=1.0 p.u.) with generator terminal voltage of $V_t$= 1 p.u. The generator has an inertia constant of 4 MJ/MVA .Write the swing equation upon occurrence of the fault. What is the initial angular acceleration .If the acceleration is assumed to be remain constant for $\Delta t$= .05 sec find the rotor angle at the end of the this time interval and new acceleration .


4. (a) What do you mean by equal area criteria. If a single machine is connected to infinite bus though two parallel lines with sudden loss of one line,draw the power angle characteristics.

(b). In the given figure a three phase fault is applied at point p. Find the critical clearing angle for clearing the fault with simultaneous opening of the breakers 1 and 2. The reactance values of various components are indicated on the diagram .The generator is delivering 1 p.u. power at the instant of the fault.


5. (a) Draw the schematic diagram of load frequency and excitation voltage regulators of a turbo generator. Starting from the block diagram model of load frequency control loop of isolated power system discuss the steady state analysis to find out the expression for deviation in frequency with necessary mathematical formulation.

(b). Two generators rated 200MW and 400MW are operating in parallel. The droop characteristics of their governors are 4% and 5%, respectively from no load to full load. Assuming that the generators are operating at 50 Hz at no load, how would a load of 600MW be shared between them? What will be the system frequency at this load? Assume free governor operation.

6. Write short notes on

(a). Two area load frequency control
(b). Numerical Solution of swing equation