

**ANNA UNIVERSITY**  
**B.E.(FULL-TIME) DEGREE EXAMINATIONS, NOVEMBER 2012**  
**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**  
**V – Semester, EE 9302 – POWER SYSTEM ANALYSIS**

Time: Three hours

Max. Marks: 100

Answer All Questions

**PART - A (10 x 2 = 20 marks)**

- The sub-transient reactance of a 400 MVA, 18 kV generator is 0.20 pu on its ratings. It is connected to a network through a 20 / 400 kV transformer. Find out the sub-transient reactance of the generator on a base of 100 MVA and 20 kV.
- Draw the zero sequence equivalent circuit of the three winding transformer with the following: Primary -  $Y_{\perp}$  Secondary -  $Y_{\perp}$  Tertiary -  $\Delta$ .
- In per-unitization why we have to select the line-to-line kV as the base voltage instead of phase voltage in 3-phase system.
- Show that positive and negative sequence currents are equal in magnitude but out of phase by 180 deg. in a line-to-line fault.
- Two generating stations having short circuit capacities of 1200 MVA and 800 MVA, operating at 11 kV are linked by an interconnected cable having a reactance of 0.5 ohm per phase. Determine the short circuit capacity of each station.
- The line currents in a 3-phase supply to an unbalanced load are respectively  $I_a = 10+j20$ ,  $I_b = 12-j10$  and  $I_c = -3-j5$  Amps. The phase sequence is abc. Determine the sequence components of currents.
- A power system has 15 buses, 10 load buses and 20 lines. Determine the dimension of the state vector, control vector, no. of real and reactive power flow equations in power flow model and dimension of Jacobian matrix.
- Why a direct solution of load flow problem is not possible?
- State the limitations of equal area criterion.
- Define the term "transient stability".

**PART-B (5x16 = 80 marks)**

11. Fig. 11 shows a generator feeding two motors through transformers and line. The ratings and reactances are given below

G1: 100 MVA, 11 kV, 3 phase,  $x = 15\%$ , T1: 3 phase, 100 MVA, 11/132 kV,  $x = 6\%$

T2: Bank of 3 single-phase transformers, each rated at 35 MVA, 66/11kV,  $x = 4\%$ .

M1: 40 MVA, 3phase, 10 kV,  $x = 20\%$ , M2: 60 MVA, 3phase, 11 kV,  $x = 15\%$

The line reactance is 80 ohms. Select a base MVA of 100 and 11.6 kV in the G1 section. Draw the reactance diagram. Indicate p.u. reactance on the diagram.

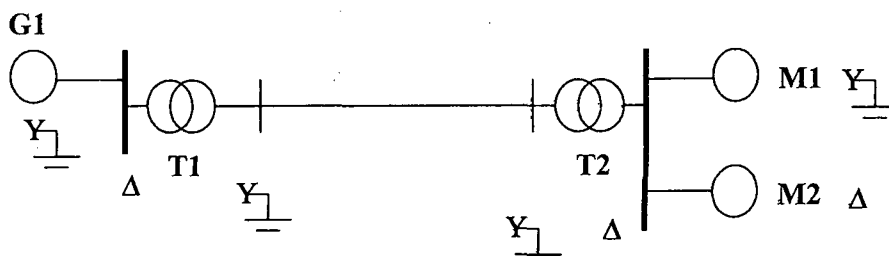


Fig. 11