Roll No.:								

B.E. / B.Tech. (Full Time) DEGREE ARREAR EXAMINATIONS, May 2013

ELECTRICAL & ELECTRONICS ENGINEERING BRANCH

FIFTH SEMESTER

EE9302- POWER SYSTEM ANALYSIS
(REGULATIONS 2008)

Time: 3 hr **Max. Marks: 100**

Answer ALL Questions

PART-A (10 X 2 = 20 Marks)

1. The subtransient reactance of a 500 MVA, 18 kV generator is 0.25 pu on its ratings. It is connected to a network through a 20 / 400 kV transformer. Find out the subtransient reactance of the generator on a base of 100 MVA and 22 kV.
2. Draw the π-equivalent circuit of tap changing transformer.
3. Define primitive network. Give an example.
4. Why a direct solution of load flow problem is not possible?
5. State the limitations of equal area criterion.
6. Define the term "transient stability".
7. The Z-bus method is very suitable for fault studies on large systems. Why?
8. Draw the zero sequence network for Y/Δ connected transformer.
9. What are the advantages of symmetrical components?
10. How the buses are classified in a power system?

PART-B (5x16 = 80 marks)

11. The data for the system whose single-line-diagram is shown in Fig. 11 is as follows:

G1: 30 MVA, 10.5 kV, X" = 1.6 Ω;

G2: 15 MVA, 6.6 kV, X" = 1.2 Ω

G3: 25 MVA, 6.6 kV, X" = 0.56 Ω

T1: 15 MVA, 33/11 kV, X=15.2 Ω/phase on h.t side

T2: 15 MVA, 33/6.2 kV, X=16.0 Ω/phase on h.t side

Transmission Line: X=20.5 Ω/phase

Loads: A: 40 MW, 11 kV, 0.9 p.f lagging;

B: 40 MW, 6.6 kV, 0.85 p.f lagging.

Choose the base power as 30 MVA, base kV as 11 kV in the G1 section. Draw the reactance diagram. Indicate pu reactances on the diagram. (16)

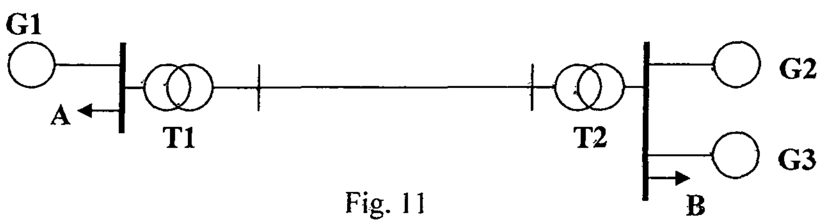

Fig. 11

12a. (i). Starting from first principles show that a diagonal element of Y-bus equals the sum of admittances connected to that bus and an off diagonal element equals the negative of the sum of admittances directly connected between the buses. (8)

(ii). Prove that [Y-bus] = $[A]^T[y][A]$. (8)

[OR]

12 b. Explain in detail the steps that are involved in the Z-bus building algorithm with the relevant equations and diagrams.

13.a. A synchronous generator and motor are rated 30,000 kVA, 13.2 kV and both have subtransient reactances of 20%. The line connecting them has a reactance of 10% on the base of the machine ratings. The motor is drawing 20,000 kW at 0.8 p.f. leading and a terminal voltage of 12.8 kV when a symmetrical three-phase fault occurs at the motor terminals. Find the subtransient currents in the generator, the motor, and the fault by using the internal voltages of the machines. (16)

[OR]

13.b. (i) Derive the relationship for fault currents in terms of symmetrical components when there is a line-to-ground (L-G) fault on phase a. Also draw a diagram showing interconnection of sequence networks for L-G fault. (8)

(ii) Show that positive and negative sequence currents are equal in magnitude but out of phase by 180 deg. in a line-to-line fault. (8)

14.a. Derive the power flow problem. Explain the step-by-step computational procedure to solve the power flow problem using the Gauss-Seidel method. (16)

[OR]

14.b. Fig. 14.b shows the one-line diagram of a simple three-bus power system with generation at bus 1. The line impedances are marked in per unit on a 100 MVA base. Find out the bus voltages after two iterations using Gauss-Seidel method. (16)

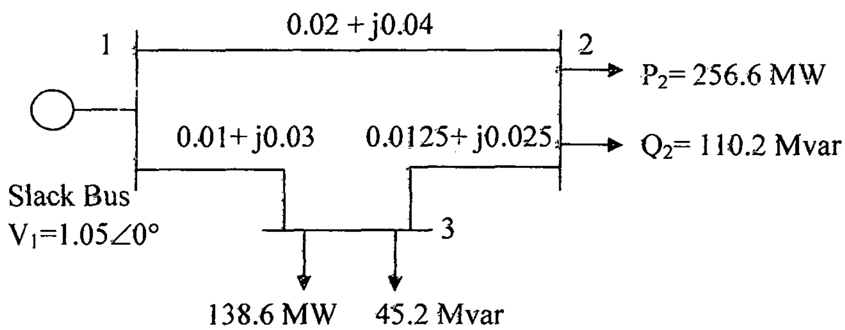

Fig.14.b

15 a. Fig15a shows transmission network. The pu reactances of the equipments are as shown. The voltage behind transient reactance of generator is 1.1 pu. The infinite bus voltage is 1+j0 p.u. The system is transmitting 1 pu power when fault occurs at the middle of the

line. Determine (i) transfer reactance for prefault, during fault and post fault condition (ii) critical clearing angle. (16)

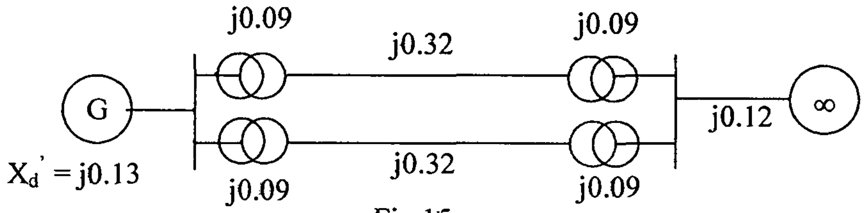

Fig 15a

[OR]

15.b Discuss the procedure for solving the swing equation using modified- Euler method. (16)