B.Tech Degree VII Semester (Supplementary) Examination June 2011

EE 703 POWER SYSTEMS II

(2006 Scheme)

Time: 3 Hours Maximum Marks: 100

PART – A

(Answer ***ALL*** questions)

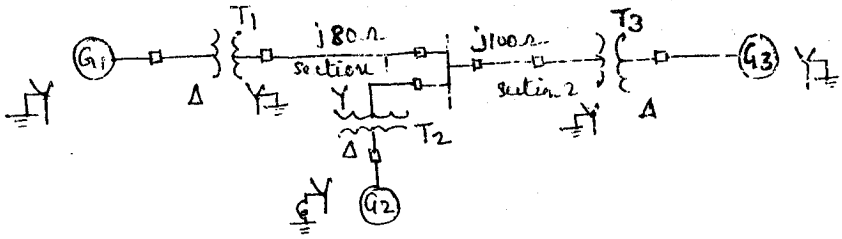
(8 x 5 = 40)

I. (a) What is the need for base values?
(b) Explain various types of buses used in load flow studies.
(c) Briefly explain automatic load dispatching.
(d) What do you mean by automatic voltage regulation?
(e) What is the significance of sub transient and transient reactance in short circuit studies?
(f) Describe positive, negative and zero sequence impedance.
(g) Explain equal area criterion of stability.
(h) Discuss about various factors affecting transient stability.

PART – B

(4 x 15 = 60)

II. The single line diagram of an unloaded power system is shown in figure. The generator and transformers are rated as follows.



Generator, G_1 = 20MVA, 13.8KV, X'' = 20%
Generator, G_2 = 30MVA, 18KV, X'' = 20%
Generator G_3 = 30MVA, 20KV, X'' = 20%
Transformer, T_1 = 25MVA, 220/13.8KV, X = 10%
Transformer, T_2 = 3 single phase units each rated at 10MVA, 127/18KV, X = 10%
Transformer , T_3 = 35 MVA, 220KV, X = 10%

Draw the reactance diagram using a base of 50MVA and 13.8 KV on the generator G_1. (15)

OR

III. Describe Newton-Raphson algorithm for load flow solution. (15)

IV. (a) Explain economic load dispatching. (5)
(b) The fuel inputs per hour of plants 1 and 2 are given as

$$F_1 = 0.2P_1^2 + 40P_1 + 120 \text{ Rs/hr.}$$

$$F_2 = 0.25P_2^2 + 30P_2 + 150 \text{ Rs/hr.}$$

Determine the economic operating schedule and the corresponding cost of generation if the maximum and minimum loading on each unit is 100MW and 25MW, the demand is 180MW and transmission losses are neglected. If the load is equally shared by both the units, determine the saving obtained by loading the units as per equal incremental production cost. (10)

OR

(P.T.O.)

V. (a) Derive the transfer function model of IEEE type I excitation systems. (10)

(b) Briefly explain the speed governing mechanism of turbo alternators. (5)

VI. (a) What are sequence networks? (5)

(b) A salient pole generator without dampers is rated 20MVA, 13.8KV and has a direct axis sub transient reactance of 0.3 per unit. The negative and zero sequence reactances are 0.35 and 0.2 per unit respectively. The neutral of the generator is solidly grounded. Determine sub transient current in the generator and the line to line voltages for sub transient conditions when a double line to ground fault involving phase b and c occurs at the terminals of the generator. Assume that the generator is unloaded and operating at rated voltage when the fault occurs. Neglect resistance. (10)

OR

VII. (a) An alternator and a synchronous motor each rated for 50MVA, 13.2 KV having sub transient reactance of 20% are connected through a transmission link of reactance 10% on the base of reactive ratings. The motor acts as a load of 30MW at 0.8 pt lead and terminal voltage 12.5KV when a 3 phase fault takes place at the motor terminals. Determine the sub transient current in the alternator, motor and at the fault point. (10)

(b) What are the main factors to be considered to select a circuit breaker? (5)

VIII. (a) Derive swing equation for a synchronous machine. (10)

(b) A 3ϕ overhead transmission line in which the line voltage at each end is kept constant at 33 KV has a reactance of 13 Ohms per phase. Find the maximum steady state power which the line can transient. (5)

OR

IX. (a) What are the advantages of HVDC transmission? (10)

(b) Write short note on FACT systems. (5)

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