C 30137 (Pages : 2) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, NOVEMBER 2017

Electrical and Electronics Engineering

EE 14 701—POWER SYSTEM ANALYSIS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*
Each question carries 5 *marks.*

1. Draw the single line diagram showing the essential parts in the power system network.
2. What is impedance and reactance diagram ? State the approximations made in impedance diagram.
3. Compare G-S method and N-R methods of load flow solutions.
4. Discuss the system constraints of economic load dispatch.
5. With the help of neat diagram write short notes on automatic voltage regulation.
6. Describe the assumptions made in short circuit studies of a large power system network.
7. Discuss about the sequence impedances of the transmission lines.
8. Draw the zero sequence equivalent network diagram for a 3-phase star connected alternator with reactance earthing.
9. State and explain equal area criterion.
10. Write notes on multi-machine stability and list the assumptions made.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 15 *marks.*

11. (a) A 120 MVA, 19.5 kV generator has a synchronous reactance of 0.15 p.u. and it is connected to a transmission line through a transformer rated 150 MVA 230/18 kV (star/delta) with X = 0.1 p.u.

    (i) Calculate the p.u. reactance by taking generator rating as base values. (5 marks)

    (ii) Calculate the p.u. reactance by taking transformer rating as base values. (5 marks)

    (iii) Calculate the p.u. reactance for a base value of 100 MVA and 220 kV on H.T. side of transformer.

    (5 marks)

Or

(b) Derive load flow algorithm using Gauss-Seidel method with flow chart and discuss the advantages of the method.

12. (a) (i) What is an incremental fuel cost ? How is it used in thermal plant operation ? (7 marks)

(ii) A power system with two generating units supplying a total load of 110 MW. The incremental fuel cost characteristics of two units are :

$IC_1 = 15 + 0.08\ P_{G1}$

$IC_2 = 13 + 1\ P_{G2}$

Determine the saving in fuel cost in Rs/hr. due to economic scheduling as compared to equal distribution of the same load between the two units. Neglect the losses.

(8 marks)

Or

(b) Explain the dynamic response of load frequency control of an isolated power system with a neat block diagram. Draw the plots of change in frequency with respect to time with and without making approximations in the analysis.

13. (a) A generator is connected through a transformer to a synchronous motor the subtransient reactance of generator and motor are 0.15 p.u. and 0.35 p.u. respectively. The leakage reactance of the transformer is 0.1 p.u. All the reactances are calculated on a common base. A three phase fault occurs at the terminals of the motor when the terminal voltage of the generator is 0.9 p.u. The output current of generator is 1 p.u. and 0.8 p.f. leading. Find the subtransient current in p.u. in the fault, generator and motor. Use the terminal voltage of generator as reference vector.

Or

(b) With a help of a detailed flow chart, explain how a symmetrical fault can be analyzed using Z bus.

14. (a) (i) Derive swing equation for a synchronous machine. (8 marks)

(ii) A 50 Hz generator is delivering 50 % of the power that it is capable of delivering through a transmission line to an infinite bus. A fault occurs that increases the reactance between the generator and the infinite but to 500 % of the value before the fault. When the fault is isolated, the maximum power that canan be delivered is 75 % of the original maximum value ? Determine the critical clearing angle for the condition described.

(7 marks)

Or

(b) Explain the modified Euler method of analyzing multi-machine power system for stability with a neat flow chart.

[4 × 15 = 60 marks]