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Reg. No. : .....

Name : .....

Sixth Semester B.Tech. Degree Examination, April 2022

(2013 Scheme)

13.605 — POWER SYSTEM ANALYSIS AND STABILITY (E)

Time : 3 Hours Max. Marks : 100

Instruction : Answer all questions from Part A and four questions from Part B, choosing not more than one question from each module.

PART – A

1. Mention two advantages of p.u. system.
2. Define short circuit MVA. What is its significance?
3. What is a sequence network?
4. Enlist the different types of faults in a power system.
5. What is a bus admittance matrix? What is its importance?
6. Mention the different types of buses in a system.
7. Define Unit Commitment problem.
8. Mention the main objectives of Automatic Generation Control.
9. Write the Swing equation and explain each term.
10. Establish the concept of spinning reserve.

(10 × 2 = 20 Marks)

P.T.O.

PART – B

Module – I

11. (a) Derive the current equations and draw the sequence network for a LLG fault.

(b) A 3-phase, 20 MVA, 10 kV alternator has an internal reactance of 5% and negligible resistance. Find the external reactance per phase to be connected in series with the alternator so that steady current on short-circuit does not exceed 8 times the full load current.

12. (a) What do you understand by a short circuit? Discuss the various methods of connecting short-circuit current limiting reactors in the power system.

(b) A 50 MVA, 11 kV, three phase alternator was subjected to different types of faults as given : 3 phase fault = 2000A, Line-to-line fault = 2600A and Line-to-ground fault = 4200A. The generator neutral is solidly grounded. Find the values of three sequence reactances of the alternator. Neglect resistances.

Module – II

13. (a) Explain the algorithm for load flow analysis using Newton-Raphson method.

(b) Derive from first principles, the equation for active and reactive powers.

14. (a) Consider a three-bus system with the parameters as given below. Find A, B and C. Neglect shunt admittance of all lines.

Bus Index	Type	p. u. voltage	Volt angle	Injected Pi	Power Qi
1	Slack	1	0	–	–
2	PQ	A	B	–0.5	–0.4
3	PV	0.9	C	0.5	–

Bus (form – to)	Line impedance
1 – 2	j0.25
2 – 3	j0.25
3 – 1	j0.25

(b) Explain the concept of DC load flow.

Module – III

15. (a) Explain the constraints of unit commitment problem.

(b) Fuel costs of two units are given by $C_1 = 0.2P_1^2 + 25P_1 + 1.0 Rs/hr$ and $C_2 = 0.2P_2^2 + 35P_2 + 2.0 Rs/hr$. If the total demand on generators is 300 MW, find economic load scheduling of the two units.

16. (a) Define the economic dispatch problem considering transmission losses and derive the expression for penalty factor.

(b) Compare economic dispatch and unit commitment.

Module – IV

17. (a) Derive the mathematical model of a single area power system for Load Frequency Control.

(b) Derive the swing equation of a synchronous machine. Explain its significance in stability studies.

18. (a) Describe the concept of equal area criterion. Establish its application in transient stability analysis.

(b) With necessary diagrams explain the concept of automatic voltage control.

(4 × 20 = 80 Marks)