

G 1679

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Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Eighth Semester

Branch : Electrical and Electronics Engineering

EE 010 801—POWER SYSTEM ANALYSIS (EE)

(New Scheme—2010 Admission onwards)

[Regular/Supplementary]

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.

Each question carries 3 marks.

1. Write the expression for per unit impedance in a three-phase power system and state how it helps simplify calculations.
2. What are transmission loss coefficients ?
3. Draw the functional diagram of real power control mechanism of a generator. Explain how a "raise" command to the speed changer will result in increased generator output power.
4. State various factors affecting selection of circuit breakers.
5. What is swing equation ?

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. Describe the single line diagram representing synchronous machines, transformers and feeders from generating end to distributing end.
7. What are co-ordination equation related to load sharing between different power plants ?
8. What are the objectives of automatic generation control ?
9. Derive the necessary equations to determine the fault current for L-L fault. Draw a diagram showing the interconnection of sequence networks.
10. Explain the concept of equal area criterion. How it can be used to study transient stability ?

(5 × 5 = 25 marks)

Turn over

Part C

Answer all questions.

Each full question carries 12 marks.

11. The primary and secondary windings of a single-phase 1000 kVA, 2000/1000 V transformer have leakage reactances of 2Ω . Find the p.u. reactance of the transformer.

Or

12. Draw the flow chart algorithm for Newton-Raphson load flow method. Also compare Gauss-Siedel and Newton-Raphson methods of load flow analysis.
13. What is "Unit Commitment" problem? Distinguish between Economic Dispatch and Unit Commitment problems.

Or

14. The cost characteristics of three units in a power plant are given by :

$$C_1 = 0.5 P_1^2 + 220 P_1 + 1800 \text{ Rs./hour.}$$

$$C_2 = 0.2 P_2^2 + 160 P_2 + 1000 \text{ Rs./hour.}$$

$$C_3 = 1.0 P_3^2 + 100 P_3 + 2000 \text{ Rs./hour.}$$

where P_1 , P_2 , and P_3 are generating powers in MW. Maximum and minimum loads on each unit are 125 MW and 20 MW respectively. Obtain the economic dispatch when the total load is 260 MW. What will be the loss per hour if the units are operated with equal loading?

15. Draw the complete block diagram representation of ALFC of single area system and describe the role of different components.

Or

16. Two generators are supplying power to a system. Their ratings are 50 and 500 MW respectively. The frequency is 50 HZ and each generator is half-loaded. The system load increases by 110 MW and as a result the frequency drops to 49.5 Hz. What must the individual p.u. regulation be if the two generators should increase their turbine powers in proportional to their ratings?
17. Draw a general circuit which can be used to determine the zero sequence network of a two winding transformer. Draw the zero sequence network of: (i) Star-Star transformer with star point grounded and (ii) Delta-Delta transformer.

Or

18. A single line to ground fault of 0.05Ω resistance occur in a 3-phase system supplied by a synchronous generator with a generated e.m.f. of 11kV between the lines. The positive, negative and zero sequence reactances of the generators and network upto the fault are 0.5Ω , 0.2Ω and 0.1Ω respectively. Find the fault current.
19. Define terms : (i) Steady state stability ; (ii) Transient stability ; (iii) Steady state stability limit ; and (iv) Transient Stability limit.

Or

20. (a) Discuss the methods to improve transient stability. (4 marks)
- (b) A 50 Hz 4-pole turboalternator rated 40 MVA, 11kV has a inertia constant of 15kW-s per kVA. Determine the kinetic energy stored in the rotor at synchronous speed. Determine the acceleration and accelerating torque if the shaft input less the rotational losses is 20 MW and the electrical power developed is 15 MW.

(8 marks)

[5 × 12 = 60 marks]