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Question Paper Code: 45303

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

Fifth Semester

Electrical and Electronics Engineering

14UEE503 - POWER SYSTEM ANALYSIS

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. What will be the per unit impedance of a synchronous motor having a rating of 100 kVA, 13.2 kV and having a reactance of 75 Ω / ph?

   (a) 0.043 pu (b) 0.057 pu (c) 0.036 pu (d) 0.298 pu

2. To control which among the following is the regulating transformer used in a power system?

   (a) Power flows (b) Frequency (c) Voltage (d) Power factor

3. What is the value of acceleration factor used in the GS method?

   (a) 2.3 – 2.7 (b) 1.6 – 2.0 (c) 1.2 – 1.5 (d) 2.4 – 2.9

4. Gauss Seidal iterative method can be used to solve a set of

   (a) linear differential equation only
   (b) linear and non linear algebraic equations
   (c) linear and non linear differential equations
   (d) linear algebraic equation only

5. Which among these is the most severe fault?

(a) Single line to ground fault (b) Double line to ground fault
(c) Line to line fault (d) Symmetrical fault

6. On which among the following factors does the magnitude of the fault current depend?

(a) Total impedance up to the fault (b) Voltage at the fault point
(c) Both (a) and (b) (d) None of these

7. What is the value of zero sequence impedance in line to line faults?

(a) $Z_0 = 1$ (b) $Z_0 = 1$ (c) $Z_0 = 3 Z_n$ (d) $Z_0 = 0$.

8. What is the fault current expression in case of LLG faults?

(a) $I_f = 3 I_{a1}$ (b) $I_f = 0$ (c) $I_f = 3 I_{a0}$ (d) $I_f = I_{a1}$

9. Kinetic energy of 800 *MJ* stored in the rotor at synchronous speed. What is the inertia constant for a 50 *Hz* four pole turbo generator rated at 100*MVA*, 11 *kV*

(a) 2 *MJ / MVA* (b) 8 *MJ / MVA* (c) 88 *MJ / MVA* (d) 6 *MJ / MVA*

10. Which among these is related to the critical clearing time of a fault in a power system?

(a) Transient stability limit (b) Steady state stability limit
(c) Frequency limit (d) None of these

PART - B (5 x 2 = 10 Marks)

11. The base KV and Base MVA of a 3 ϕtransmission line is 33KV and 10 MVA respectively. Calculate the base current and base impedance.

12. What are the types of buses and list the quantities specified and the quantities to be determined from load flow study for various types of buses?

13. State the relative frequency of occurrence of various types of faults.

14. What is Short-Circuit Capacity (SCC)?

15. How to improve the transient stability of power system?

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Explain briefly about transmission line model. (8)

(ii) Explain the simple algorithm for the formation of Y-bus matrix. (8)

Or

(b) Explain the modelling of generator, load, transmission line and transformer for power flow, short circuit and stability studies. (16)

17. (a) Explain the algorithm of Gauss Seidal method for the load flow problem with a neat flow chart and relevant equations. (16)

Or

(b) Explain clearly with detailed flow chart, the computational procedure for load flow solution using N-R method, when the system contains all types of buses. (16)

18. (a) A 11 *kV*, 100 *MVA* alternator having a sub-transient reactance of 0.25 *pu* is supplying to a 50 *MVA* motor having a sub-transient reactance of 0.2 *pu* through a transmission line. The line reactance is 0.05 *pu* on a base of 100 *MVA*. The motor is drawing 40 *MW* at 0.8 *p.f.* leading with a terminal voltage of 10.95 *kV* when a 3-phase fault occurs at the generator terminals. Calculate the total current in generator and motor under fault conditions. (16)

Or

(b) Derive the formula for fault current, fault bus voltages and current through the lines for a 3 phase symmetrical fault at a bus in a power system using Z_{bus}. State the assumptions made in the derivation. (16)

19. (a) Derive an expressions for the positive sequence current I_{a1} of an unloaded generator when it is subjected to a line to line fault. (16)

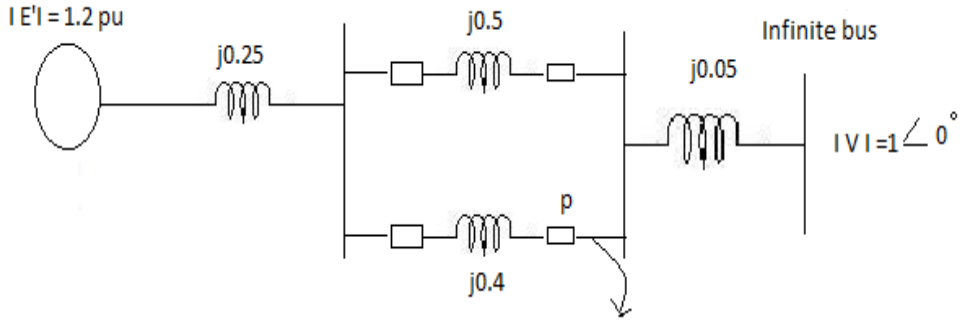
Or

(b) Derive the relationship to determine the fault current for a single line to ground fault on an unloaded generator. Draw an equivalent network showing the interconnection of sequence of networks to simulate single line to ground fault. (16)

20. (a) Derive the swing equation of a single machine connected to an infinite bus system and explain the steps of solution by Runge-kutta method. (16)

Or

(b) For the given system a three phase fault occurs at the point P. Find the critical clearing angle for clearing the fault with simultaneous opening of the breakers 1 and 2.The reactance values of various components are indicated on the diagram. The generator is delivering 1.0 pu power at the instant preceding the fault.



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