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Question Paper Code: 45303

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

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. The bus matrix of power system is not a

   (a) symmetric (b) square
   (c) full matrix (d) having dominant diagonal element

2. The P.U impedance of the circuit element is 0.15. If the base *kV* and *MVA* values are reduced to half of its value then new value of circuit element in p.u will be

   (a) 0.05 (b) 0.15 (c) 0.3 (d) 0.60

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. Initially what will be the voltage at all the PQ buses for solving the load flow problem using NR method.

   (a) $V_i = 1 \angle 90°$ (b) $V_i = 1 \angle 0°$ (c) $V_i = 1 \angle 180°$ (d) $V_i = 1 \angle 45°$

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. What is the value of negative sequence impedance?

(a) 1 (b) Z
(c) Same as positive sequence (d) ∞

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

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

8. Which one of the following is absent in line to line fault?

(a) positive sequence impedance (b) negative sequence impedance
(c) zero sequence impedance (d) all of the above

9. What is the range of 'δ' for stable operation?

(a) $0° < \delta < 45°$ (b) $45° < \delta < 90°$ (c) $0° < \delta < 90°$ (d) $0° < \delta < 120°$

10. Critical clearing time of fault in a power system is related to

(a) transient stability (b) reactive power
(c) S.C. current (d) voltage limit

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)

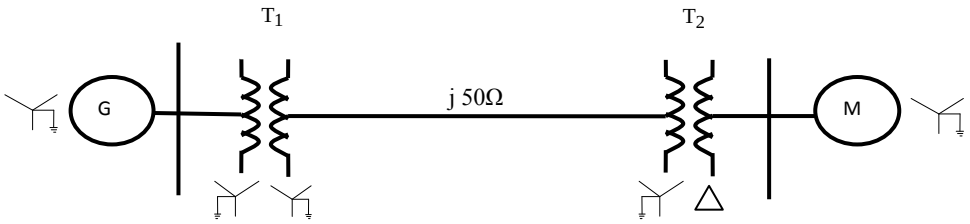
16. (a) Draw the p.u impedance diagram for the power system shown in Fig. Neglect the resistance and use a base of 100MVA, 220KV on the 50 Ω line. The ratings of the generator, motor and transformer are

Generator: 40 MVA, 25KV, $X'' = 20\%$

Motor: 50 MVA, 11KV, $X'' = 30\%$

Transformer T1: Y-Y type, 40 MVA, 33Y-220Y, $X'' = 15\%$

Transformer T2: Y-Δ type, 30 MVA, 11Δ-220Y, $X'' = 15\%$



(16)

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) Draw the sequence network connection for LL fault at any point in a power system . From that obtain an expression for the fault current. (16)

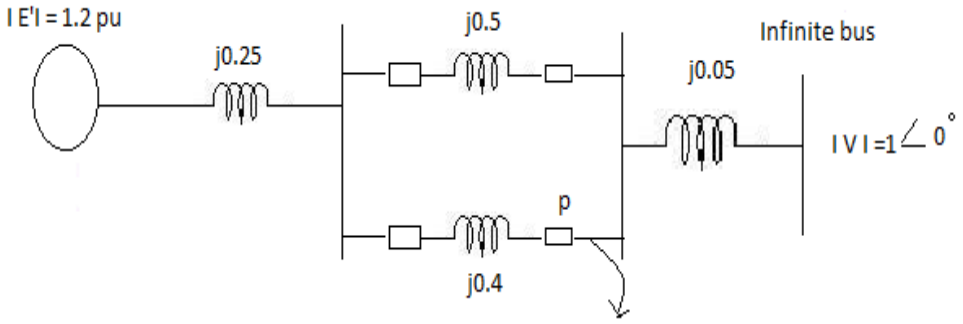
Or

(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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