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Question Paper Code: U5302

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Fifth Semester

Electrical and Electronics Engineering

21UEE502-POWER SYSTEM ANALYSIS

(Regulations 2021)

Duration: Three hours | Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

1. The off diagonal element of Y bus is called ….. and the diagonal element of Ybus is called…… CO1- U

   (a) Mutual & self-admittance (b) self & mutual- admittance

   (c) Mutual & self-impedance (d) self & mutual -impedance

2. For the formation of bus admittance matrix if a branch i is not connected to node j, then Yij is…… CO1- U

   (a) 0 (b) 1 (c) -1 (d) None of these

3. In load-flow analysis, a voltage-controlled bus is treated as a load bus in subsequent iteration if ..... limit is violated CO1- U

   (a) Real power (b) Reactive power

   (c)Voltage magnitude (d) Voltage phase angle

4. Which of the following matrix is used for load flow studies CO1- U

   (a) Jacobian Matrix (b) Admittance matrix

   (c) Impedance matrix (d) Sparse matrix

5. If all the three phases are short circuited and voltages and currents remain balanced even after the fault, then such type of fault is called CO1- U

   (a) Single line to ground fault. (b) Double line to ground fault

   (c) Line to line fault (d) Symmetrical fault.

6. If the circuit breaker speed is 8 cycles or slower, the multiplying factor is CO1- U

(a) 1.0 (b) 1.1 (c) 1.2 (d) 1.4

7. In a single line to ground fault, the fault current is CO1- U

(a) $If = 3Ia_1$ (b) $If = Ia_1$ (c) $If = 6Ia_1$ (d) $If = Ia_1/3$

8. The value of zero sequence impedance in line to line fault is …….. CO1- U

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

9. Which among these is a classification of power system stability CO1- U

(a) Frequency stability (b) Rotor angle stability

(c) Voltage stability (d) All of these

10. By using which component can the transient stability limit of a power system be CO1- U

(a) Series capacitor (b) Series resistance (c) Series inductor (d) Shunt resistance

PART – B (5 x 2= 10Marks)

11. Outline the term Per Unit value. CO1- U

12. Write the power flow equation. CO1- U

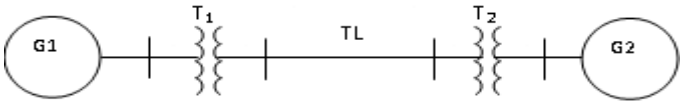
13. What is meant by fault in a power system? CO1- U

14. Classify the types of unbalanced faults. CO1- U

15. Distinguish transient stability and transient stability limit. CO1- U

PART – C (5 x 16= 80Marks)

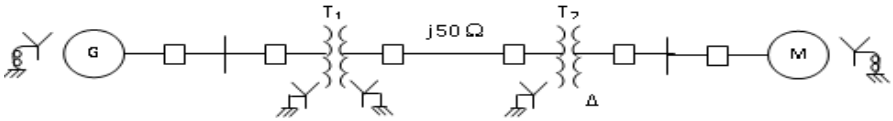
16. (a) Choosing a common base of 20 MVA on the transmission line, compute the per unit impedance (reactance) of the components of the power system shown in Fig. and draw the positive sequence impedance (reactance) diagram. CO1-App (16)



Gen 1: 20 MVA, 10.5 kV, X″ = 1.4 ohm
Gen 2: 10 MVA, 6.6 kV, X″ = 1.2 ohm
Tr 1: 10 MVA, 33/11 kV, X = 15.2 ohm per phase on high tension side
Tr 2: 10 MVA, 33/6.2 kV, X = 16.0 ohm per phase on high tension side
Transmission line: 22.5 ohm per phase

Or

(b) Choose base of 100 MVA, 220 kV in 50 Ω lines. Draw the reactance diagram for the power system shown in Fig. Neglect resistance. CO1-App (16)



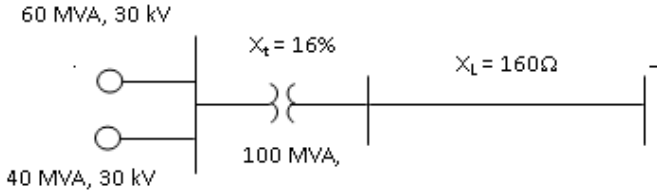
The ratings of the generator, motor and transformer are given below.
Generator: 40 MVA, 25 kV, X″ = 20%
Synchronous motor: 50 MVA, 11 kV, X″ = 30%
Y - Y Transformer: 40 MVA, 33 / 220 kV, X = 15%
Y - Δ Transformer: 30 MVA, 11/220 kV (Δ/Y), X = 15%.

17. (a) Implementing Load Flow Equations Using Newton-Raphson Method (Polar Form) CO2-App (16)

Or

(b) Deriving and Implementing the Fast Decoupled Method for Load Flow Analysis CO2-App (16)

18. (a) The system shown in figure is initially on no load with generators operating at their rated voltage with their emfs in phase. The rating of the generators and transformers and their respective percent reactances are marked on the diagram. The line reactance is 160 ohm. A three phase fault occurs at the receiving end of the transmission line. Determine the short circuit current and the short circuit MVA. CO3-Ana (16)



Or

(b) A three phase transmission line operating at 33 kV and having a resistance and reactance of 5 ohm and 20 ohm respectively is connected to a generating station bus bar through a 15 MVA step up transformer which has a reactance of 0.06 p.u. Two generators one 10 MVA having 0.1 p.u reactance and another 5 MVA having 0.075 p.u reactance are connected to the bus bars. Calculate the short circuit MVA and the fault current when three phase short circuit occurs at the high voltage terminals of the transformer. CO3-Ana (16)

19.	(a)	Develop the connection of sequence network when a line to line fault occurs in a power network	CO4-Ana	(16)
		Or		
	(b)	Develop the connection of sequence network when a double line to ground fault occurs in a power network	CO4-Ana	(16)
20.	(a)	Discuss the Euler's method with flow chart to find solution for the swing equation.	CO5-Ana	(16)
		Or		
	(b)	Derive Swing equation used for stability studies in power system.	CO5-Ana	(16)