Register Number:……..

KUMARAGURU
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B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2018)

Sixth Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

U18EEI6203 : Power System Analysis

COURSE OUTCOMES

CO1: Draw the reactance diagram for a given power system network and make load flow calculations.
CO2: Model the sequence networks in terms of symmetrical components
CO3: Calculate the fault currents, voltages when symmetrical and unsymmetrical faults occur
CO4: Analyze the stability of power system network using various methods.
CO5: Analyze load flow, fault and stability of power system network using simulation tool.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

1.	What is the need for system analysis in planning and operation of power system?	CO1	[K1]
2.	A generator rated at 30 MVA, 11kV, has a reactance of 20%. Calculate it's per unit reactance for a base of 50 MVA and 10kV.	CO1	[K3]
3.	Name the faults involving ground and the fault which do not have zero sequence current flowing.	CO2	[K2]
4.	If $I_a = 12\angle 0^o\ A,\quad I_b = 10\angle 90^0\ A$ and $I_C = 10\angle -90^0\ A,$ find the zero sequence current.	CO2	[K3]
5.	Differentiate between sub transient and transient reactance.	CO3	[K2]
6.	What is the need for short circuit studies or fault analysis?	CO3	[K2]
7.	How will you improve the transient stability limit of power system?	CO4	[K1]
8.	Give the expression for critical clearing time.	CO4	[K1]
9.	Why power flow analysis is made?	CO5	[K2]
10.	What are the capabilities of ETAP?	CO5	[K1]

Answer any FIVE Questions:-

PART B (5 x 16 = 80 Marks)

(Answer not more than 400 words)

11.	a)	What are the steps to be followed to draw the per phase reactance diagram.	8	CO1	[K1]
	b)	A 120 MVA, 19.5 kV gen has a synchronous reactance of 0.15 P.U. and it is connected to a transmission line through a transformer rated 150 MVA, 230/18kV (Y/Δ) with X=0.1 P.U.	8	CO1	[K3]

(a) Calculate the P.U. reactance by taking generator rating as base values.
(b) Calculate the P.U. reactance by taking transformer rating as base values.
(C) Calculate the P.U. reactance for a base value of 100 MVA, 220 kV on HT side of transformer.

12. a) The voltage across a 3 phase unbalanced load are Va=300∟200V,Vb=360∟900V and Vc= 500∟-1400V,Determine the symmetrical components of voltages; Phase sequence is abc. 10 CO2 [K3]

b) Derive the expression for fault current in double line to ground fault on an unloaded generator in terms of symmetrical components. 6 CO2 [KL]

13. a) The p.u. impedances are on a base of 50MVA and 12kV. Symmetrical short circuit occurs at bus 3 with zero fault impedance, Using Z_{bus} matrix determine the fault current, bus voltages and also the currents contribution by the generators. 16 CO3 [K3]

$$Z_{bus} = j \begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array} \begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 0.07286 & 0.03857 & 0.05571 \\ 0.03857 & 0.05571 & 0.04714 \\ 0.05571 & 0.04714 & 0.10143 \end{bmatrix} \end{array}$$

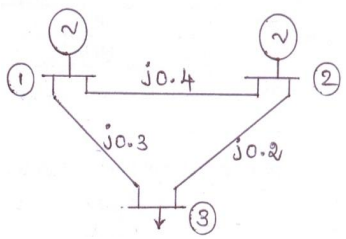
14. a) Obtain swing equation used for stability studies in power system. 8 CO4 [K2]

b) Write the algorithmic steps in Runge Kutta fourth order method for analyzing multimachine power system for stability. 8 CO4 [K2]

15. a) Compare the Gauss Seidal, Newton Raphson and Fast Decoupled load flow solutions. 8 CO5 [K2]

b) How to Perform Load Flow Study? How to perform load flow analysis using ETAP software? 8 CO5 [K2]

16. a) The following figure shows a three bus power system. 16 CO1 [K3]



Bus1: Slack bus, V=1.05 ∟0° PU

Bus2: PV bus, V = 1.0 P.U., Pg = 3 P.U.

Bus3: PQ bus, PL = 4 P.U., QL = 2 P.U.

Carry out one iteration of load flow solution by Gauss-seidel method. Neglect limits on reactive power generation.

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