Reg. No.												

Question Paper Code	12846

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024

Fifth Semester

Electrical and Electronics Engineering

20EEPC501 - POWER SYSTEM ANALYSIS

Regulations - 2020

Duration: 3 Hours **Max. Marks: 100**

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	What is a single line diagram?	2	K1	CO1
2.	State the advantages of per unit computation.	2	K1	CO1
3.	What is the need for load flow study?	2	K2	CO2
4.	Compare Gauss-Seidal and Newton Raphson method of load flow analysis.	2	K2	CO2
5.	What are the causes for a balanced fault in a power system?	2	K1	CO3
6.	What is sub transient reactance?	2	K1	CO3
7.	Find the positive sequence current, if $I_a=18\angle 0^0$ A, $I_b= 10\angle -30^0$ A, and $I_c=10\angle 30^0$ A.	2	K1	CO4
8.	Draw the zero sequence networks for a Star-Delta transformer.	2	K2	CO4
9.	What is a power angle curve?	2	K1	CO5
10.	Define critical clearing angle and critical clearing time.	2	K2	CO5

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) Determine Y bus for the 3 bus system. The line series impedance is as follows. *13 K2 CO1*

Line	Impedance (p.u)
1-2	0.06+j0.18
1-3	0.03+j0.09
2-3	0.08+j0.24

Neglect shunt capacitance of the line.

OR

b) The single line diagram of a three phase power system is shown in Figure 1. Select a common base of 100MVA and 13.8KV on the generator side and construct the per unit impedance diagram. *13 K2 CO1*

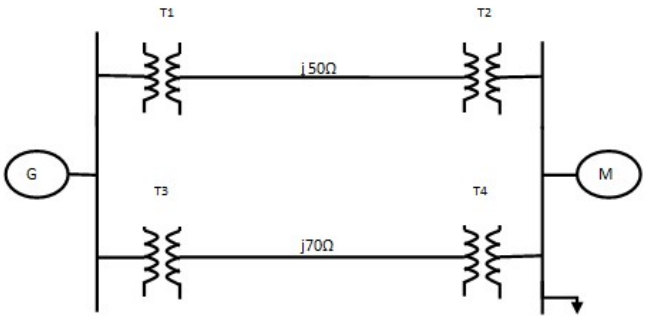

Figure 1

G: 90MVA, 13.8kV, X=18% ; T1:50MVA, 13.8/220kV, X=10%
T2:50MVA, 220/11kV, X=10% ; T3:50MVA, 13.8/132kV, X=10%
T4:50MVA, 132/11kV, X=10% ; M: 80MVA, 10.45kV, X=20%
Load: 57MVA, 0.8 p.f lagging at 10.45 kV

12. a) Discuss in detail about the algorithm for Gauss-Seidal load flow analysis and give the steps for its implementation when all the types of buses are present in the system. *13 K3 CO2*

OR

b) Explain in detail the algorithm for load flow solution by Newton-Raphson iterative method using Y bus and draw the flowchart for the same. *13 K3 CO2*

13. a) A symmetrical fault occurs at bus 4 of the system through Z_f=j0.14 p.u as shown in Figure 2. Compute the fault current, post fault voltages, and line flows. *13 K3 CO3*

Generator G_1 ,G_2 :100MVA, 20kV,X_1=15%.
Transformer T_1, T_2:X_{leak}=9%,
Transmission line L_1,L_2: X_1=10%

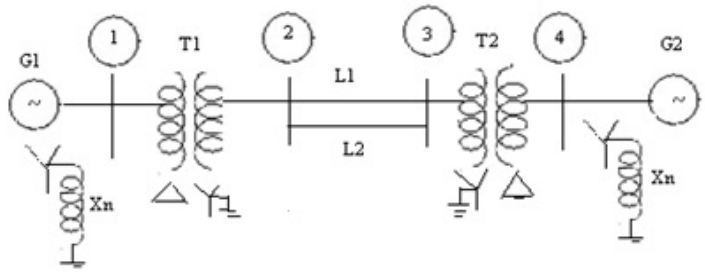

Figure 2

OR

b) With the help of an algorithm explain how a symmetrical fault can be analyzed by using Z_{bus}. *13 K3 CO3*

14. a) i) Derive the expression for fault current when a line to ground fault occurs on an unloaded generator. *10 K3 CO4*

ii) Draw the connection of sequence networks for the same. *3 K3 CO4*

OR

b) The sequence components of currents in a system are I_{a1}=8.334∠90°, I_{a2}=1.6668∠90°, I_{a0}=6.6672∠90°. Find I_a, I_b, I_c. *13 K4 CO4*

15. a) Derive the swing equation of a single machine connected to an infinite bus system. *13 K3 CO5*

OR

b) Derive an expression for the critical clearing angle and clearing time to analyse the stability of a power system. *13 K3 CO5*

PART - C (1 × 15 = 15 Marks)

16. a) Draw the reactance diagram for the given network in Figure 3 with a base of 50MVA and 13.8kV on generatorG_1 *15 K3 CO1*

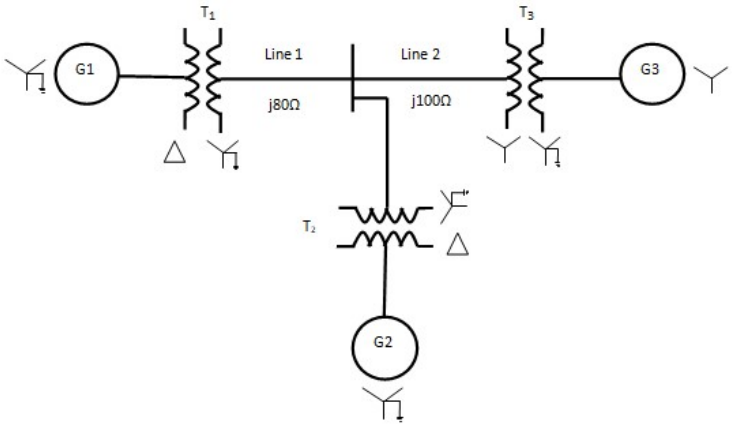

Figure 3

G_1: 20MVA, 13.8kV, X''=20% ; G_2: 30MVA, 18.0kV, X''=20%
G_3: 30MVA, 20.0kV, X''=20% ;
T_1: 25MVA, 220/13.8 kV, X =10%
T_2:3Single phase unit each rated 10MVA, 127/18 kV, X =10%
T_3: 35MVA, 220/22 kV, X =10%

OR

b) i) The moment of inertia of a 4 pole, 100 MVA, 11 kV, three phase, 0.8 power factor, 50 Hz turbo alternator is 10000 kgm^2. Calculate H, M. *8 K3 CO5*

ii) A 50 Hz 8 pole generator rated at 80 MVA, 11kV has an inertia constant of 7 MJ/MVA. Find the moment of inertia M. *7 K3 CO5*