Reg. No.																

Question Paper Code	14595

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2026

Fifth Semester

Electrical and Electronics Engineering

20EEPC501 - POWER SYSTEM ANALYSIS

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART – A (i) (MCQ)
(16 × 1 = 16 Marks)
Answer ALL Questions

		Marks	K – Level	CO
1.	Single line diagram of which of the following power system is possible? a) Power system with LG fault b) Balanced power system c) Power system with LL fault d) Power system with LLG fault	1	K1	CO1
2.	Single line diagram does not represents: a) Ratings of machines b) Neutral wire of transmission line c) Delta connection of transformer winding d) Star connection	1	K2	CO1
3.	A power system will have greater flexibility of operation if they have a) Only Base load plants operating in combination b) Various types of power plants operating in combination c) Only Peak load plants operating in combination d) Only thermal power plants operating in combination	1	K2	CO1
4.	Which method is the fastest for convergence in load flow problems? a) Gauss-Seidel b) Newton-Raphson c) Fast Decoupled d) None of the above	1	K1	CO2
5.	What is the main cause of the Gauss-Seidel method requiring a large number of iterations? a) Simple programming b) Slow convergencec c) Low memory requirement d) High accuracy	1	K1	CO2
6.	In a 4-bus system with 4 transmission lines, the Y-bus sparsity is a) 0.75 b) 0.25 c) 0.4 d) 0.5	1	K3	CO2
7.	Symmetrical faults are considered the most severe types of power system faults because a) They happen most frequently on overhead lines b) They result in the highest short-circuit current magnitudes c) They introduce zero-sequence components d) They permanently damage the system load balance	1	K2	CO3
8.	What percentage of total power system faults do symmetrical three-phase faults roughly constitute? a) 5% b) 50% c) 70% d) 90%	1	K1	CO3
9.	According to electrical standards, what is the minimum required rating of a circuit breaker protecting a continuous load calculated at? a) 100% of the continuous load current b) 110% of the continuous load current c) 125 % of the continuous load current d) 150% of the continuous load current	1	K3	CO3

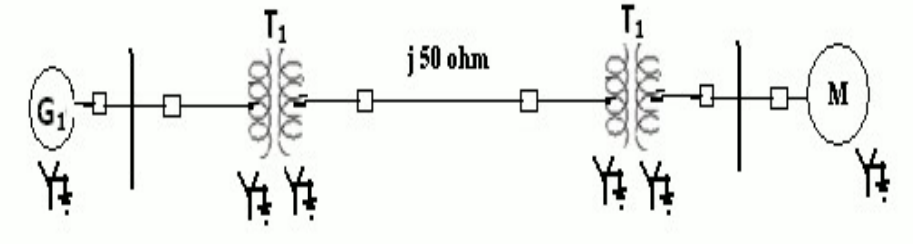
10.	In a power system, an unsymmetrical fault causes a) Balanced currents in all phases b) Equal voltage magnitudes c) Unequal phase currents and voltages d) Constant frequency only	*1*	*K2*	*CO4*
11.	A single line-to-ground fault involves: a) All three phases shorted together b) One phase connected to ground c) Two phases connected together d) Two phases connected to ground	*1*	*K2*	*CO4*
12.	In a balanced three-phase system under normal conditions, the negative and zero sequence components are: a) Maximum b) Infinite c) Zero d) Equal to positive sequence components	*1*	*K3*	*CO4*
13.	Power system stability refers to the ability of the system to a) Increase voltage continuously b) Remain in synchronism after a disturbance c) Reduce transmission losses only d) Operate at unity power factor	*1*	*K1*	*CO5*
14.	In stability studies, the swing equation represents a) Load flow analysis b) Rotor dynamics of synchronous machines c) Transformer losses d) Line impedance calculation	*1*	*K3*	*CO5*
15.	A system is said to be stable if, after disturbance, it a) Loses synchronism permanently b) b) Returns to an acceptable operating condition c) Stops generating power d) Operates with zero losses	*1*	*K3*	*CO5*
16.	The Modified Euler method is mainly used to a) Solve algebraic equations b) Solve ordinary differential equations numerically c) Perform matrix inversion d) Solve partial differential equations only	*1*	*K3*	*CO5*

PART – A (ii) (Short Answer Questions)
(8 × 3 = 24 Marks)
Answer ALL Questions

17.	A generator rated 25MVA, 11kV has a reactance of 15%. Calculate its p.u. reactance for a base of 50MVA and 10KV.	*3*	*K3*	*CO1*
18.	Analyze the π circuit representation of a transformer with off –nominal ratio 'α'.	*3*	*K4*	*CO1*
19.	Identify the advantages and disadvantages of the Gauss-Seidel method.	*3*	*K3*	*CO2*
20.	When the generator bus treated as a load bus in NR load flow study? Identify the reactive power and bus voltage when the generator bus is treated as load bus.	*3*	*K3*	*CO2*
21.	Identify the short circuits occur in a power system. Summarize two objectives of short circuit analysis.	*3*	*K3*	*CO3*
22.	Discover the symmetrical components Va1, Va2, and Va0 in terms of unbalanced vectors Va, Vb and Vc.	*3*	*K4*	*CO4*
23.	Demonstrate the zero-sequence network diagram of adelta-delta connected transformer.	*3*	*K4*	*CO4*
24.	Identify the machine problems seen in the stability study.	*3*	*K3*	*CO5*

PART - B (Descriptive Answer Questions)
(5 × 12 = 60 Marks)
Answer ALL Questions

25. a) Examine the reactance diagram for the power system shown in fig. Neglect resistance and use a base of 100MVA, 220kV in 50Ω line. The ratings of the generator, motor and transformer are give below. *12 K4 CO1*



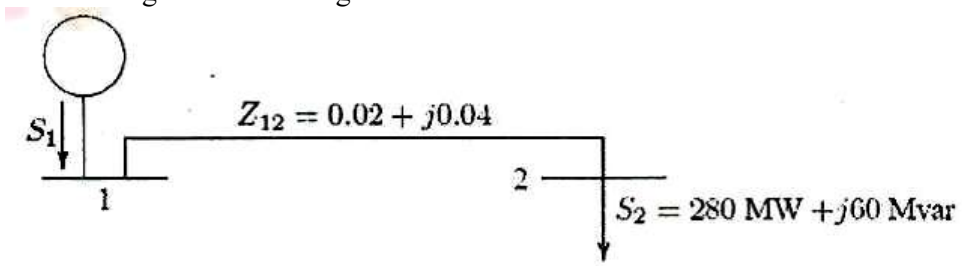
Generator: 40MVA, 25KV, X'' =20%.
Synchronous Motor: 50MVA, 11KV, X'' =30%
T1: Y-Y transformer : 40MVA 33/220KV, X=15%
T2:Y- Y transformer : 30 MVA 11/220KV, X=15%

OR

b) Draw the network diagram and find Y Bus matrix using inspection method. *12 K4 CO1*

Bus Code	Line Impedance in PU	Charging Admittance
1-3	0.1+j0.2	0.03
2-3	0.2+j0.4	0.02
2-4	0.25+j1.5	0.04
3-4	0.4+j0.8	0.01
1-2	0.1+j0.6	0.06

26. a) In the power system network shown in figure, bus 1 is slack bus with V1= 1.0 + j0.0 per unit and bus 2 is a load bus with S2 =280MW = j60MVAR. The line impedance on a base of 100MVA is Z = 0.02 + j0.04 per unit. Using Gauss – Seidal method, assume the initial estimate of $V2^{(0)}$ = 1.0 + j0.0 and perform four iterations. Also find S1 and the real, reactive power loss in the line, assuming that the bus voltages have converged. *12 K4 CO2*



OR

b) With a neat flow chart, analyze the computational procedure for the load flow solution using the Newton Raphson method when the system contains all types of buses. *12 K4 CO2*

27. a) A 3 phases 5 MVA, 6.6 kV alternator with a reactance of 8% is connected to a feeder series impedance (0.12+j0.48) ohm/phase/km through a step up transformer. The transformer rated at 3 MVA, 6.6kV/33kV and has reactance of 5%. Determine the fault current supplied by the generator operating under no load with a voltage of 6.9 kV, when a 3 phases symmetrical fault occurs at a point 15km along the feeder. *12 K3 CO3*

OR

b) A symmetrical fault occurs on bus 4 of system shown in figure; calculate the fault current, post fault voltages, line flows. Generator G1 ,G2 :100MVA,20KV,X1=15%.Transformer T1, T2:,Xleak=9%, Transmission line L1,L2: X1=10% — *12 K3 CO3*

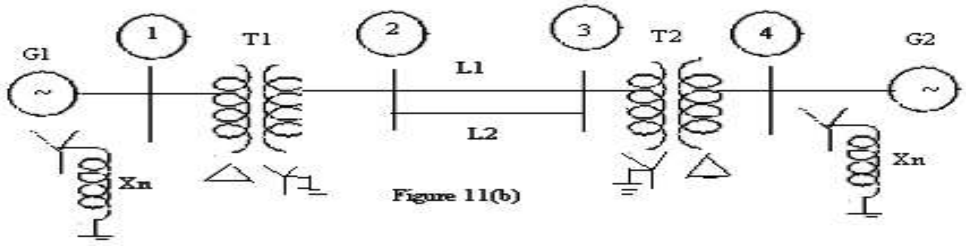


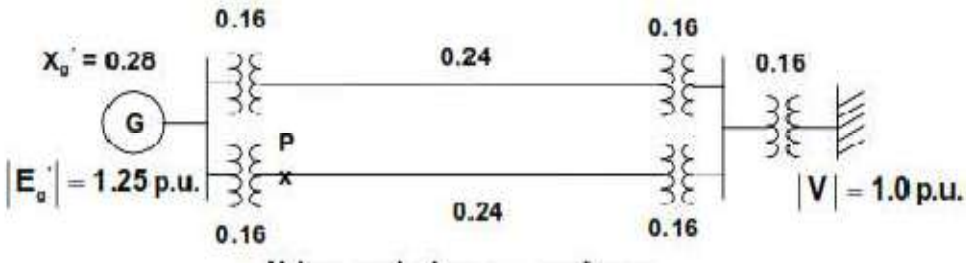
Figure 11(b)

28. a) Develop the sequence impedance of synchronous machine, transmission lines and Star connected loads. — *12 K3 CO4*

OR

b) Develop the sequence network for a double line to ground (LLG) fault. — *12 K3 CO4*

29. a) Develop the swing equation used for stability studies in power system. — *12 K3 CO5*

OR

b) In the power system shown in Fig three phase fault occurs at P and the faulty line was opened a little later. Find the power output equations for the pre -fault, during fault and post-fault condition. If delivering 1.0 p.u before fault occurs, calculate δcc. — *12 K3 CO5*