A **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: R5302

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2025

Fifth Semester

Electrical and Electronics Engineering

R21UEE502 – POWER SYSTEM ANALYSIS

(Regulations R2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. 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

2. Identify and explain the significance of off-diagonal and diagonal elements in the Y-bus matrix. CO1- U

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

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

3. Explain under what condition a voltage-controlled bus is treated as a load bus in later iterations of load flow analysis. CO3- U

   (a) Real power (b) Reactive power (c) Voltage magnitude (d) Voltage phase angle

4. Classify the type of matrix used in load flow analysis. CO3- 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 CO4- U

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

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

6. Identify which among these is the most common occuring fault? CO4- U

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

(c) Three phase fault (d) Line to line fault

7. In a single line to ground fault, the fault current is CO5- U

(a) If = 3Ia1 (b) If = Ia1 (c) If = 6Ia1 (d) If = Ia1/3

8. The value of a3 is CO5- U

(a) 1 (b) 1 ∠120 (a) 1 (b) 1 ∠120

9. Identify which among these is a classification of power system stability CO6- U

(a) Frequency stability (b) Rotor angle stability

(c) Voltage stability (d) All of these

10. Swing equation is used for CO6- U

(a) Stability analysis (b) Load flow analysis

(c) Symmetrical fault analysis (d) Un Symmetrical fault analysis

PART – B (5 x 2= 10 Marks)

11. Interpret the concept of Per Unit value in power system studies. CO1- U

12. Translate the general power flow equations used in power system analysis. CO3- U

13. Explain the meaning of a fault in a power system. CO4- U

14. Classify the types of unbalanced faults occurring in a power system. CO5- U

15. Contrast transient stability with transient stability limit. CO6- U

PART – C (5 x 16= 80 Marks)

16. (a) Model various power system components with equivalent circuits for power flow, short circuit and stability studies. CO2 App (16)

Or

(b) Construct the structure and restructure of a power system and also model the Electricity market Entities. CO2 App (16)

17. (a) Model clearly the algorithmic steps for solving load flow equations using Newton Raphson method (polarform) when the system contains all types of buses. Assume that the generators at the P-V buses have adequate Q-limits. CO2 App (16)

Or

	(b)	Construct with neat flow chart explain the computational procedure for load flow solution by choosing a appropriate method and acceleration for small system when the system contains all types of buses.	CO2 App	(16)
18.	(a)	A three phase transmission line operating at 33 kV and having a resistanceandreactanceof5ohmand20ohmrespectivelyisconnectedtoag enerating 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.	CO4 App	(16)
		Or		
	(b)	Identify the symmetrical short-circuit test on an unloaded alternator to draw the resulting oscillogram, and Explain the direct-axis reactance'sxd, xd' and xd" from it.	CO4 App	(16)
19.	(a)	Develop the connection of sequence network when a double line to ground fault occurs in a power network	CO4 App	(16)
		Or		
	(b)	(i) The voltage across a 3 phase unbalanced load are Va =300$\angle$20^o, V_b = 360$\angle$90^o and V_c = 500$\angle$-140^o .Determine the symmetrical components of voltage. Phase sequence ia abc. (ii) Develop the boundary condition for various unsymmetrical faults on power system.	CO4 App	(8) (8)
20.	(a)	Apply the concept of rotor dynamics to develop the swing equation for stability studies in power systems.	CO5 App	(16)
		Or		
	(b)	Organize a detailed discussion on steady-state stability studies in power systems.	CO5 App	(16)