

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A (25 Marks)

1. a) Why the incidence matrices for a given network are not unique? [2]
- b) What is primitive network? Write the performance equation of primitive network in admittance form. [3]
- c) What are the limitations of Newton Raphson Method. [2]
- d) What is advantage of acceleration factor in GS load flow method? [3]
- e) Write the objective of finding fault levels at bus. [2]
- f) Write the applications of series reactors. [3]
- g) A synchronous machine having $E=1.2\text{pu}$ is supplying power to an infinite bus with voltage 1.0pu . If the transfer reactance is 0.6pu , find the steady state power limit. [2]
- h) What is the significance of Synchronizing power Coefficient? [3]
- i) Write the methods to improve transient stability. [2]
- j) Derive the swing equation. [3]

PART - B (50 Marks)

2. Derive the expressions for Bus admittance matrices by Singular transformation Method. [10]
- OR**
3. Derive the expression for adding a element between to existing buses of the existing network by using Z_{BUS} building algorithm? [10]
4. a) Write the necessity of power flow studies.
- b) Develop the power flow model using decoupled method and explain the assumptions to arrive at the fast decoupled load flow method. [3+7]
- OR**
5. a) Define load flow problem. Classify the buses in power system and discuss the important of slack bus.
- b) Describe the Newton Raphson method for the solution of power flow equations in power systems by deriving necessary equations. [4+6]
6. a) Why the analysis of unsymmetrical faults can be more easily done with the help of symmetrical components than by a direct solution of the unbalanced circuit.
- b) Three 10MVA generators each having a reactance of 0.2pu are operating in parallel. They feed a transmission line through a 30MVA transformer having a per unit reactance of 0.05 . Find the fault MVA for a fault at the sending end of line. [4+6]

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PART - B (50 Marks)

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OR

- a) Why the phase shift in the positive sequence and negative sequence quantities through a star delta transformer are opposite to each other?
- b) The line current in three phase supply are $I_a = 12 + j24A$, $I_b = 16 - j2A$ and $I_c = -4 - j6A$. The phase sequence is abc. Calculate the sequence components of currents. [4+6]

8.a) What is power system stability? Define stability limit of the system.

- b) A 50Hz generator of reactance 1pu is connected to an infinite bus through a line of reactance of 0.5pu. $E = 1.1pu$ and $V = 1pu$. The inertia constant is 5MW-sec/MVA. The generator is loaded to 50% of the maximum power limit. Find the frequency of natural oscillations. [3+7]

OR

- 9.a) Write short notes on methods to improve steady state stability of power system.
- b) Derive the expression for steady state stability limit using ABCD parameters. [4+6]

10.a) Why the use of automatic reclosing circuit breakers improve system stability.

- b) What is equal area criterion? Explain how it can be used to study stability with any suitable example. [4+6]

OR

11.a) List the assumptions made in the transient stability solution techniques.

- b) A three phase generator delivers 1pu power to an infinite bus through a transmission network when a fault occurs. The maximum power which can be transferred during prefault, during fault and post fault conditions is 1.75pu, 0.4pu and 1.25pu. Find critical clearing angle. [4+6]