Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER M.TECH DEGREE EXAMINATION (R), DECEMBER 2023

POWER SYSTEMS

(2021 Scheme)

Course Code: 21PS102

Course Name: Computer Applications in Power Systems

Max. Marks: 60 **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Explain bus incidence matrix A, basic cutset incidence matrix B and basic loop incidence matrix C with a suitable example.
2. Compare Newton Raphson method and Fast Decoupled load flow method for load flow studies.
3. Explain the triangular factorization.
4. Explain Static Var Compensator (SVC) in load flow.
5. A 20 MVA, 13.8 kV generator has a direct axis sub transient reactance of 0.35pu. Its negative sequence reactance is 0.5pu and zero sequence reactance is 0.1pu. The neutral of the generator is grounded. Find the fault current, when a single line to ground fault occurs.
6. Explain the fault calculation using Z_{bus}.
7. Explain the objectives of load forecasting.
8. Explain the load forecasting methods.

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

9. Explain the building of Z_{bus}, when a link is added between two existing nodes. (6)

OR

10. Formulate the bus impedance matrix for the network shown in Figure 1. All the impedances are in pu. (6)

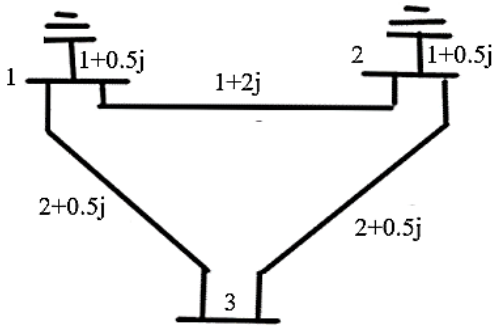

Figure 1.

MODULE II

11. With the help of algorithm, explain Newton Raphson method for load flow studies. (6)

OR

12. Figure 2 shows the SLD of a 3 bus PS. The magnitude of voltage at bus 1 is adjusted to 1.05pu, voltage magnitude at bus 3 is fixed at 1.04pu with a real power generation of 200MW. A load consisting of 400MW & 250MVAR is taken from bus 2. Line impedances are marked in pu on a 100MVA base. Obtain the power flow by Fast Decoupled Load Flow method. (6)

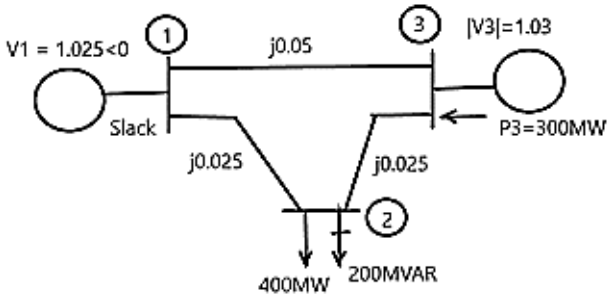

Figure 2.

MODULE III

13. Explain the application of sparsity and optimal ordering in load flow problems. (6)

OR

14. Explain the multi-objective optimal power flow. (6)

MODULE IV

15. List and explain any three FACT devices used in load flow analysis. (6)

OR

16. Explain the incorporation of Thyristor Controlled Series Compensator (TCSC) in load flow analysis. (6)

MODULE V

17. Explain the algorithm for calculating the system conditions after the occurrence of a three phase to ground fault through fault impedance Z_f per phase and ground impedance Z_g. (6)

OR

18. A three-phase transmission line operating at 33kV and having a resistance and reactance of 5Ω and 20Ω respectively is connected to a generating station busbar through a 15MVA step up transformer which has a reactance of 0.06pu. Connected to the busbars are 2 generators, one 10MVA having 0.10pu reactance and another 5MVA having 0.075 pu reactance. Calculate the short circuit MVA and the fault current when a three-phase short circuit occurs at the load end of the transmission line, as shown in Figure 3. (6)

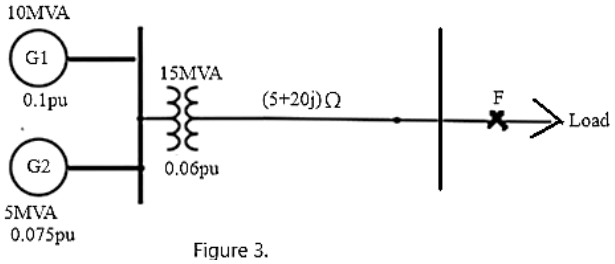

Figure 3.

MODULE VI

19. Explain the estimation of periodic components in the deterministic part of the load. (6)

OR

20. Explain the long-term load predictions using econometric models. (6)

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