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

# SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

### FIRST SEMESTER M.TECH DEGREE EXAMINATION (Regular), FEBRUARY 2022
*(Power Systems)*
**(2021 Scheme)**

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|---|---|
| **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. Develop Bus admittance matrix from graph theoretic approach.
2. Write short note on AC and DC load flow.
3. Discuss the role of triangular factorization in power system analysis?
4. State the objectives of voltage and phase angle regulators in power flow
5. Draw the sequence network for SLG fault and write the equations for fault current.
6. Briefly describe about different types of faults in power system.
7. Explain the various objectives of load forecasting
8. Elucidate the advantages and disadvantages of energy approach in load forecasting.

## PART B
*(Answer one full question from each module, each question carries 6 marks)*

### MODULE I

9. For the network shown, draw the oriented graph and find the following

     a) Element-node incidence matrix
     b) Bus incidence matrix
     c) Basic Cutset incidence matrix
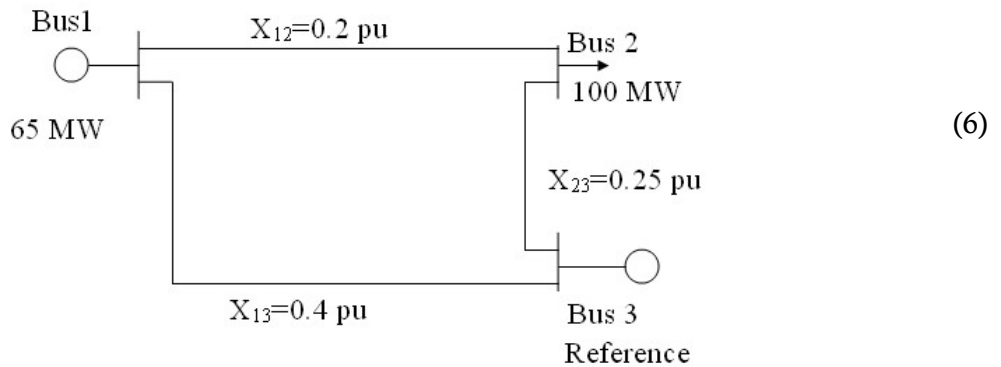     d) Basic loop incidence matrix
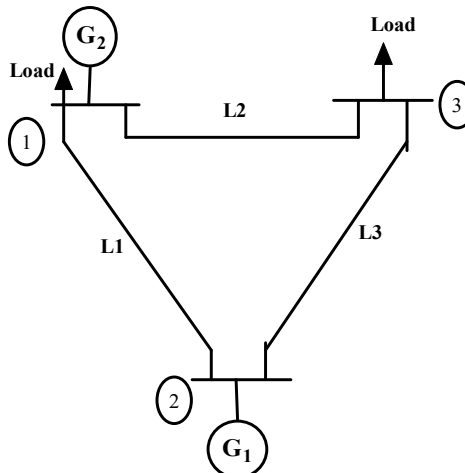
(6)

**OR**

10. Derive the expression for $Z_{bus}$ building algorithm for addition of a link.     (6)

## MODULE II

11. a) Explain Newton Raphson algorithm for load flow analysis.     (4)
    b) State the advantages and disadvantages of Newton Raphson algorithm     (2)

**OR**

12. Determine the line power flow and slack bus power using the concept of DC power flow equations.



    (6)

## MODULE III

13. A two bus system is shown in figure below. If a load of 125MW is transmitted from plant 1 to the load, a loss of 15.625MW is incurred. Determine the generation schedule and the load demand if the cost of received power is Rs.24/MWhr. Solve the problem using coordination equations and the penalty factor method. The incremental production costs of the plants are:

$$\frac{dF_1}{dP_1} = 0.025\,P_1 + 15$$

$$\frac{dF_2}{dP_2} = 0.05\,P_2 + 20$$

    (6)
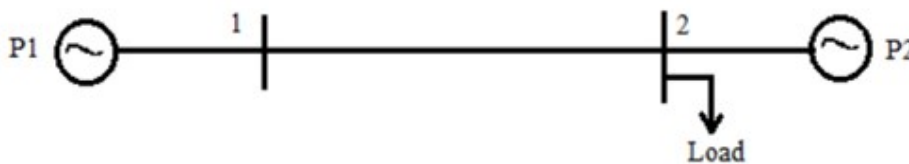


**OR**

14. a) Explain the significance of penalty factor.     (2)
    b) Derive the objective function for economic load dispatch with losses     (4)

## MODULE IV

15. With schematic diagram of the power system and UPFC model, explain the power flow control.     (6)

**OR**

16. Explain the role of static synchronous compensators in providing real power compensation. (6)

### MODULE V

17. a) Prove that symmetrical components transformation is power invariant. (3)
    b) Derive the expression for fault current and draw the interconnection of sequence networks for double line to ground fault on the terminals of an unloaded generator. (3)

**OR**

18. The reactance's of an alternator rated 10 MVA, 6.9 kV are $X_1$ =15 %; $X_2$ = 20 % and $Xg_0$ = 5 %. The neutral of the alternator is grounded through a reactance of 0.38 Ω. Line to line fault, with fault Impedance j0.15 p.u. occurs at the terminals of the alternator. Determine the line currents, fault current and the terminal voltages. (6)

### MODULE VI

19. Explain any three approaches to load forecasting with its advantages and disadvantages (6)

**OR**

20. a) Explain the various types of load forecasting (4)
    b) State the essential requirements of load forecasting (2)

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