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EE72

# Seventh Semester B.E. Degree Examination, May / June 08
## Computer Techniques in Power Systems

Time: 3 hrs. Max. Marks:100

**Note :** *Answer any FIVE full questions.*

1 a. Define the following terms with an illustrative example :
i) Oriented graph ii) Tree iii) Co–tree **(06 Marks)**

b. The bus incidence matrix of a power system network is shown below. Construct the oriented graph of the system.

$$A = \begin{bmatrix} 1 & 0 & 0 & -1 & 0 & 0 & 1 \\ -1 & -1 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & -1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & -1 & -1 \end{bmatrix}$$ **(06 Marks)**

c. Derive the expression for $Y_{BUS}$ using singular transformation. **(08 Marks)**

2 a. Explain the formation of $Z_{BUS}$ using $Z_{BUS}$ building algorithm. **(14 Marks)**

b. What is a primitive network? Give the representation of a typical component and arrive at the performance equations both in impedance and admitted forms. **(06 Marks)**

3 a. What is load flow analysis? What is the data required to conduct load flow analysis? Explain how buses are classified to carryout load flow analysis in power system. What is the significance of slackers? **(08 Marks)**

b. The following is the system data for a load flow solution.

| BUS code | Admittance in P.U. |
|---|---|
| 1 – 2 | 2 – j 8 |
| 1 – 3 | 1 – j 4 |
| 2 – 3 | 0.666 – j 2.664 |
| 2 – 4 | 1 – j 4 |
| 3 – 4 | 2 – j 8 |

| Schedule of active and reactive power | | | | |
|---|---|---|---|---|
| BUS code | P(P.U) | Q(P.U) | V (P.U) | Remarks |
| 1 | – | – | 1.06 | Slack bus |
| 2 | 0.5 | 0.2 | | PQ bus |
| 3 | 0.4 | 0.3 | | P – Q bus |
| 4 | 0.3 | 0.1 | | P – Q bus |

Determine the voltages at the buses at the end of first iteration using Gauss – Seidal method. Take the acceleration factor as 1.6. **(12 Marks)**

4 a. Explain the representation of transformers with fixed tap changing during load flow analysis. **(08 Marks)**

b. Explain with a flow chart and equation how the load flow analysis is conducted using Newton Raphson method. **(12 Marks)**

5 a. Derive the co–ordination equations for economic load allocation in a thermal power system with the consideration of transmission losses. **(10 Marks)**

b. Three power plants of total capacity of 425 MW and scheduled for operation to supply total system load of 300 MW. Find the optimum load scheduling if the plants have the following incremental fuel costs in Rs/ MWhr and the generation constraints, if the transmission losses are neglected.

$\frac{dc_1}{dP_1} = 30 + 0.15P_1$ $\quad 25MW \le P_1 \le 125MW$

$\frac{dc_2}{dP_2} = 40 + 0.20P_2$ $\quad 30MW \le P_2 \le 100\,MW$

$\frac{dc_3}{dP_3} = 15 + 0.18P_3$ $\quad 50MW \le P_3 \le 200MW$ **(10 Marks)**

6 a. Write down the transmission loss formula. Obtain the loss co-efficient formula for a system consisting of two plants supplying several loads through a transmission line network. **(10 Marks)**

b. With a neat sketch, develop the mathematical model of speed governing system of steam turbine used in load frequency control. Also draw the block diagram. **(10 Marks)**

7 a. With the help of a flow chart explain the modified Euler method for transient stability studies. **(10 Marks)**

b. With the help of block diagram explain the representation of excitor control system and the speed governor system in stability studies. **(10 Marks)**

8 Writer a brief note on any four of the following:

a. Area control error (ACE)

b. Automatic economic load dispatch **(10 Marks)**

c. Formation of $Y_{BUS}$ by rule of inspection, when mutual coupling is absent.

d. Importance of swing equation for stability analysis

e. Fast decoupled load flow analysis. **(10 Marks)**

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