CBCS SCHEME

USN | | | | | | | | | | |

17EE71

Seventh Semester B.E. Degree Examination, July/August 2021
Power System Analysis – II

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.

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

c. Derive the expression from Y-bus using singular transformation. **(08 Marks)**

2 a. Explain the load flow studies procedure with expressions as per Gauss-Seidel method for power system having all types of buses. **(08 Marks)**

b. Using Gauss –Seidel load flow method compute at the end of iteration (i) Voltages at buses 2 and 3 (ii) Real and Reaction powers at the slack bus.

LINE DATA

Bus p - q	$Z_{p,q}$	Y'_{pq}
1 - 2	j0.4	j0.2
2 - 3	j0.2	j0.1
3 - 1	j0.4	j0.2

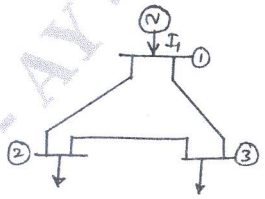

Fig.Q2(b)

INPUT DATA

Bus (i)	P_i	Q_i	V_i	Remarks
1	-	-	$1.03\underline{0}°$	Slack
2	-0.4	-0.3	-	PQ
3	-0.5	-0.4	-	PQ

(12 Marks)

3 a. Draw the flow chart of Newton-Raphson method in polar coordinated for load flow analysis. **(12 Marks)**

b. Find the values of x_1 and x_2 for the following equations by Newton-Raphson method upto 2nd iteration.
$x_1^2 - 4x_2 - 4 = 0$; $2x_1 - x_2 - 2 = 0$ using $x_1^{(0)} = 1$ and $x_2^{(0)} = -1$. **(08 Marks)**

4 a. Deduce the fast decoupled load flow model, clearly stating all the assumptions made and give the flow chart. **(10 Marks)**

b. Explain the concept of controlling voltage profile by the use of (i) Generators (ii) VAR Generators (iii) Transformers. **(10 Marks)**

5 a. Derive the condition for minimum total fuel cost in a system comprising of K-thermal generating units, considering transmission losses. **(08 Marks)**

b. Incremental fuel costs in Rs./MWh for a plant consisting of two units are

$$\frac{dC_1}{dP_1} = 0.2P_1 + 40 \; ; \quad \frac{dC_2}{dP_2} = 0.4P_2 + 30$$

and the generator limits are as follows,

$30MW \le P_1 \le 175$ MW

$20MW \le P_2 \le 125$ MW

Assume that both units are operating at all times. How will the load be shared between the two units as the system load varies over the full range of the load values? What are the corresponding values of the plant incremental costs? **(12 Marks)**

6 a. What is optimal unit commitment and also explain Dynamic Programming method. **(08 Marks)**

b. Explain Reliability consideration in unit commitment problem. **(06 Marks)**

c. Explain optimal generation scheduling. **(06 Marks)**

7 a. Discuss the problem formation and solution procedure of optimal scheduling for hydrothermal plants. **(10 Marks)**

b. What are transmission line loss coefficients? Derive an expression for transmission loss as a function of plant generation for a two plant system. **(10 Marks)**

8 a. Explain the major function of security analysis. **(05 Marks)**

b. Explain the three major function of system security. **(05 Marks)**

c. Write a note on :

(i) Maintenance Scheduling (ii) Power System Reliability **(10 Marks)**

9 a. Explain the algorithm for short circuit studies. **(10 Marks)**

b. Derive the generalized algorithm for finding the elements of bus impedance matrix when a LINK is added to the partial network. **(10 Marks)**

10 a. Explain point-by-point solution of swing equation. **(08 Marks)**

b. Explain the steps involved in determining multimachine stability. **(05 Marks)**

c. Explain modified Euler's method of solving swing equation. **(07 Marks)**

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