CBCS SCHEME

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15EE71

Seventh Semester B.E. Degree Examination, July/August 2022
Power System Analysis - II

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. With usual notations, prove that $Y_{BUS} = A^T [Y] A$ using singular transformation. **(06 Marks)**

b. For the data given in table Q1(b), obtain Y_{BUS} using singular transformation.

Element No	From Bus	To Bus	Self Impedance (pa)	Mutual Impedance (pu)
1	0	1	- 0.2 j	-
2	1	2	0.05 j	-
3	2	3	0.04 j	0.2 j (with 2)
4	3	1	0.02 j	-

Table : Q1(b) **(10 Marks)**

OR

2 a. For the 3 – bus system shown in Fig. Q2(a), estimate the voltages at bus 2 and bus 3 at the end of first iteration using G.S method. The values of data required for load flow is listed in table Q2(a). The reactive power limits at bus 2 is - 0.5 ≤ Q2 ≤ 0.5 p.u. **(10 Marks)**

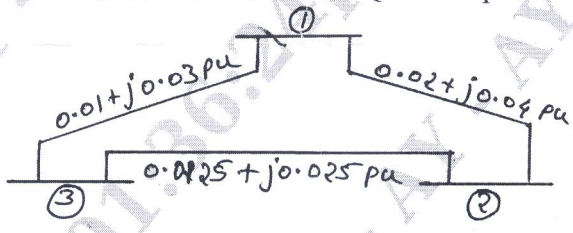


Fig. Q2(a)

Bus No	P_i (pu)	Q_i (pu)	$\|V_i\|$ (pu)	δ_i	Type
1	-	-	1.05	0	Slack
2	0.3	-	1.02	-	PV
3	-1.4	- 0.5	-	-	PQ

Table : Q2(a)

b. Explain how buses are classified to carry out load flow analysis in power system. **(06 Marks)**

Module-2

3 a. With all assumption, deduce FDLF model and give flow chart. **(10 Marks)**

b. Compare Gauss – Seidal and Newton – Raphson methods of load flow analysis. **(06 Marks)**

OR

4 a. Derive expression for all elements of Jacobian matrices on Polar form. **(10 Marks)**

b. Explain any two method of control of voltage profile. **(06 Marks)**

Module-3

5 a. With a usual notation, derive generalized transmission loss formula and B – Coefficients. **(10 Marks)**

b. The operating cost of C_1 and C_2 in Rs/hr of two generator units each of 100MW rating of a thermal plant are : $C_1 = 0.2\,P_1^2 + 40\,P_1 + 120$ Rs/hr ; $C_2 = 0.25\,P_2^2 + 30\,P_2 + 150$ Rs/hr

i) Find optimal generation of 2 units for a total demand of 180 MW and corresponding total cost.

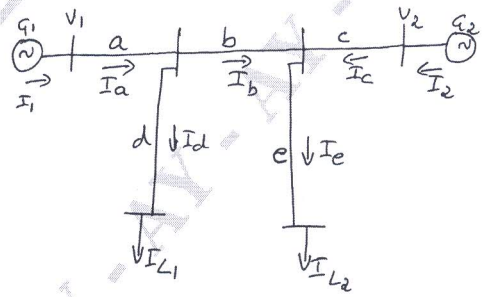
ii) Savings in Rs/hr in the case, as compare to equal sharing between two machines. **(06 Marks)**

OR

6 a. Calculate the loss coefficient in pu and MW^{-1} on a base of 50 MVA for the network shown in Fig. Q6(a) below :

$I_a = 1.2 - j0.4$, $I_b = 0.4 - j0.2$, $I_c = 0.8 - j0.1$, $I_d = 0.8 - j0.2$, $I_e = 1.2 - j0.3$,
$Z_a = 0.02 + j0.08$, $Z_b = 0.08 + j0.32$, $Z_c = 0.02 + j0.08$, $Z_d = 0.03 + j0.12$,
$Z_e = 0.03 + j0.12$, $V_{ref} = 1\angle 0$. **(10 Marks)**

Fig. Q6(a)



b. Explain the following :

i) Input – Output curve ii) Heat rate curve related to thermal plants. **(06 Marks)**

Module-4

7 a. With the block diagram, explain system static level classification. **(08 Marks)**

b. Discuss the solution procedure of optimal scheduling of Hydrothermal plants. **(08 Marks)**

OR

8 a. Explain the following : i) Loss of Load Probability (LOLP).

ii) Frequency and duration of state (FAD). **(04 Marks)**

b. With the help of bath tub curve, explain Power System Reliability. **(04 Marks)**

c. With the help of flow chart, explain Optimal load flow solution. **(08 Marks)**

Module-5

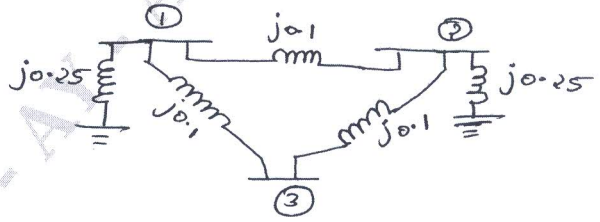
9 a. Explain Solution of Swing equation by Point by Point method. **(08 Marks)**

b. Derive the generalized algorithm for finding the elements of bus – impedance matrix Z_{bus} when a branch is added to the partial network. **(08 Marks)**

OR

10 a. For the three – bus network shown in Fig. Q10(a), build Z_{bus}. **(10 Marks)**

Fig. Q10(a)



b. Explain solution of swing equation by Range – Kutta 4th Order method. **(06 Marks)**

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