B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E.   **Semester: VII**
Branch: Electrical & Electronics Engineering   **Duration: 3 hrs.**
Course Code: 19EE7PCPS2   **Max Marks: 100**
Course: POWER SYSTEMS - II   **Date: 27.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) How to incorporate transformer with off-nominal turns ratio to form Ybus by inspection method?   **06**

b) Form Ybus by singlular transformation method for the given data in table 1(b).   **08**

Elements	Bus P-Q	Self-impedance	Mutual impedance
1	1-2	j0.6	
2	2-3	j0.5	j0.1 (with element 1)
3	3-4	j0.5	j0.2 (with element 2)
4	1-4	j0.3	

Table 1(b)

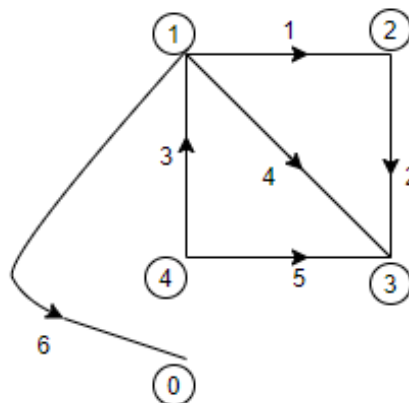c) For the graph given in fig. 1(c), obtain B, C and K. considering element 3 as link.   **06**

Fig. 1(c)

UNIT - II

2 a) Discuss the importance of load flow analysis in power system. How buses are classified? Explain briefly   **06**

b) Obtain bus voltages using GS load flow solution at the end of first iteration for the data shown in table. Every line is having a total shunt admittance of j0.02 pu. **14**

Line Data				Bus Data			
SB	EB	R (P.U)	X (P.U)	BUS NO.	P_i (P.U)	Q_i (P.U)	VTG
1	2	0.05	0.15	1	--	--	1.06
1	3	0.1	0.3	2	0.5	--	1.04
2	3	0.15	0.45	3	-0.1	0.5	--
2	4	0.1	0.3	4	-0.3	-0.1	--
3	4	0.05	0.15				

OR

3 a) Starting from first principles, deduce GS method of load flow solution. **08**

   b) In the power system shown in fig 3(b), line 1-2 has a series impedance of $0.04 + j\,0.12$ pu with line charging admittance of $j\,0.02$ pu. The generation and load data are given in the table 3(b). Slack bus voltage is $(1+j0)$ pu. The voltage magnitude at bus 2 is to be maintained at 1.05 pu and the generator at this bus has Q generation limits between 0 and 0.5 pu. With $(1+j0)$ pu initial voltage at bus 2. Determine its voltage at the end of first iteration, using GS method. Consider base MVA as 100. **12**

Bus	Type	Generation		Load	
		P (MW)	Q (MVAr)	P (MW)	Q (MVAr)
1	Slack	--	--	--	--
2	PV	30	--	60	20

Table 3(b)

Fig 3(b)

UNIT - III

4 a) Starting from first principles, deduce power flow expression for NR method. **08**

   b) In a two bus system shown in fig 4(b), bus1 is slack bus with V=1 pu and bus 2 is load bus with P=10 MW, Q=30 MVAr. The line impedance is $(0.12 + 0.12\,j)$ pu and half line charging admittance of $j\,0.02$ pu on a bus of 100 MVA. Using FDLF method compute $|V2|$ and $\delta2$ up to one iteration **12**

0.12+0.12j
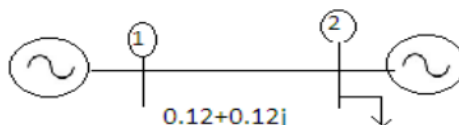
Fig 4(b)

UNIT - IV

5 a) A two bus system, without generator limits, has been considered as shown in fig. 5(a),where $P_{load\ (A)} = 400\ MW, P_{load\ (B)} = 100\ MW\ and$ **10**
$P_{loss} = 0.08(P_{G(A)}) + 10$
$(IFC)_A = 0.06\ P_{G(A)} + 4.0\ Rs/MWh$
$(IFC)_B = 0.07\ P_{G(b)} + 4.0\ Rs/MWh$
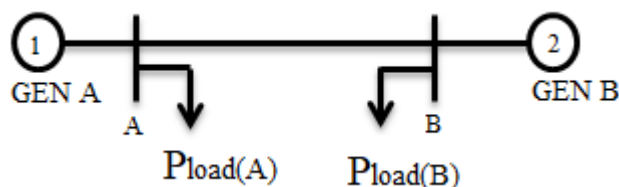Find the optimal generator scheduling for each plant.

fig. 5(a)

b) Obtain B coefficients for the system shown in fig 5(b). (take up to 3 decimals) **10**
$I_a = 1\angle 0^0\ pu \qquad Z_a = 0.16\angle 80°\ pu$
$I_b = 0.8\angle 0^0\ pu \qquad Z_b = 0.12\angle 75°\ pu$
$I_c = 1\angle 0^0\ pu \qquad Z_c = 0.18\angle 75°\ pu$
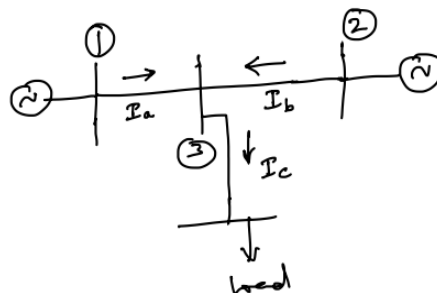Take $V_3 = 1\angle 0^0\ pu$

Fig 5(b)

UNIT - V

6 a) With expressions and block diagram explain closing of ALFC loop **08**
   b) For an isolated power system, consider the following system data **06**
   Rating of the generator: 100 MW
   Nominal operating load: 75 MW
   Inertia constant : 5.0 Sec
   Speed regulation of the governor: 5 %
   Nominal frequency: 60 Hz.
   Find

   a) Gain constant and time constant of ALFC.
   b) Static frequency change for the uncontrolled case when the load is increased by 15 MW. (consider linear change)
   c) System frequency during change of load.

OR

7 a) Explain with block diagram speed governor system of ALFC **12**
   b) With block diagram explain digital computer configuration. **08**

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