a load flow solution for the sample system shown in Fig. 2. below using the following methods : **15**

(a) Newton-Raphson using Y_{BUS} in rectangular coordinates. Assume the off-diagonal elements of the submatrices J_1, J_2, J_3 and J_4 of the Jacobian to be zero.

(b) Newton-Raphson using Y_{BUS} in polar coordinates.

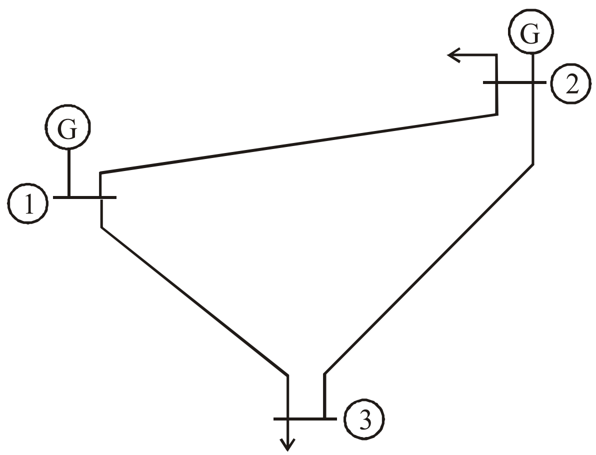

Fig. 2

Impedance for Sampling System shown in Fig. 2 :

AA-43

M. Tech. EXAMINATION, Dec. 2018

(First Semester)

(B-Scheme) (Re-appear Only)

EE(PS)

MPS505B

ADVANCED POWER SYSTEM ANALYSIS

Time : 3 *Hours*] [*Maximum Marks :* 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

Unit I

1. A 220-kV, three-phase transmission line is 40 km long. The resistance per phase is 0.15Ω per km and the inductance per phase is 1.3263 mH per km. The shunt capacitance is negligible. Use the short line model to find the voltage and power at the sending end and the voltage regulation and efficiency when the line is supplying a three-phase load of :

   (a) 381 MVA at 0.8 power factor lagging at 220 kV

   (b) 381 MVA at 0.8 power factor leading at 220 kV. **15**

2. Write short notes on the following :

   (a) Farranti effect **8**

   (b) State Estimation. **7**

Unit II

3. (a) Form the incidence matrices $\hat{A}$, A, K, B, $\hat{B}$, C and $\hat{C}$ for the network shown in Fig. 1 : **8**

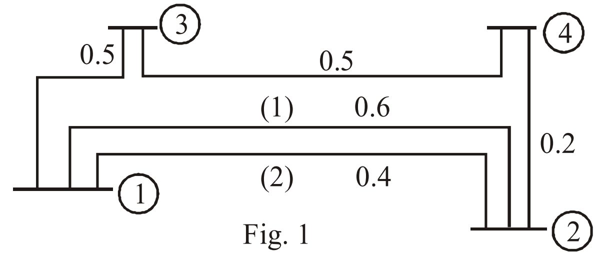

Fig. 1

   (b) Form the network matrices Y_{BUS}, Y_{BR} and Z_{LOOP} by singular transformation. **7**

4. Prove that when there is no mutual coupling the diagonal and off-diagonal elements of the bus admittance matrix Y_{BUS} can be computed from :

$$Y_{ii} = \sum_{j} y_{ij}$$

$$Y_{ij} = -y_{ij}$$

where y_{ij} is the sum of the admittances of all lines connecting buses i and j. **15**

Unit III

5. With the tolerances of 0.01 per unit for the changes in real and reactive bus powers, obtain

8. A generator having a solidly grounded neutral and rated 50-MVA, 30-kV has positive, negative and zero-sequence reactances of 25, 15 and 5 percent, respectively. What reactance must be placed in the generator neutral to limit the fault current for a bolted line-to-ground fault to that for a bolted three-phase fault. **15**

Bus Code p - q	Impedance z_{pq}	Line charging $y'_{pq}/2$
$1-2$	$0.08+j0.24$	0
$1-3$	$0.02+j0.06$	0
$2-3$	$0.06+j0.18$	0

Scheduled generation and loads and assumed bus voltages for sample system of Fig. 2 :

Bus code p	**Assumed bus voltage**	**Generation Mega-watts**	**Generation Mega-vars**	**Load Mega-watts**	**Load Mega-vars**
1	1.05+j0	0	0	0	0
2	1.0+j0	20	0	50	20
3	1.0+j0	0	0	60	25

6. (a) Give the detailed comparison between G-S and N-R methods. **8**

(b) Write short note on DC load flow study. **7**

Unit IV

7. The symmetrical components of a set of unbalanced three-phase currents are $I_a^{o} = 3\angle -30^{o}$, $I_a^{1} = 5\angle 90^{o}$ and $I_a^{2} = 4\angle 30^{o}$ and obtain the original unbalanced phasors. **15**