MANMOHAN TECHNICAL UNIVERSITY
Office of the Controller Examinations
2083 Bhadra Exam (2026 August) Model Question

School: Engineering	**Level:** Master	**Time:** 3 Hours
Program: M.Sc.P.S.E.	**Year/Part:** I/I	**Full Marks:** 50
Subject: EG801EE – Computer Aided power System Analysis		**Pass Marks:** 25

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

GROUP A (Attempt any FIVE Questions) **[5x3=15]**

1. Explain the need of high voltage transmission in modern power system. Briefly discuss the relationship between active power and frequency in power systems.
2. Derive the basic equations for the load flow study using Gauss-Seidel method. With respect to this method, explain about acceleration factor.
3. Explain the need of DC power flow analysis in power systems.
4. What is meant by an ill-conditioned power flow problem? Mention any two methods used to deal with it.
5. Explain the application of OPF in a power system.
6. Explain the step-by-step procedure for the formation of bus impedance matrix using addition of branch and addition of link for the power system network.

GROUP B (Attempt Any SEVEN Questions) **[7x5=35]**

1. A 3-phase, 50Hz, 150 km long transmission line has the following parameters: r=0.15 ohm/km, x= 0.5 ohm/km and y=3*10^{-6} mho/km. If the line is represented by nominal- π, determine: i) ADCD constant of the line. ii) Power at unity power factor that can be received if the voltage at each end is maintained at 220 KV.
2. Calculate the voltages and angles at all buses after first iteration by using Fast Decoupled Load Flow Method for the system given in table. The line parameters are given in per unit on a 100MVA base.

Bus Data					
Bus	V (pu)	P_G (MW)	Q_G (MVAR)	P_L (MW)	Q_L (MVAR)
1	1.03	-	-	-	-
2	1.01	200	-	-	-
3	-	-	-	100	50

Line Data			
Bus		Impedance	line charging admittance
From	To		
1	2	0.15+j0.04	j0.06

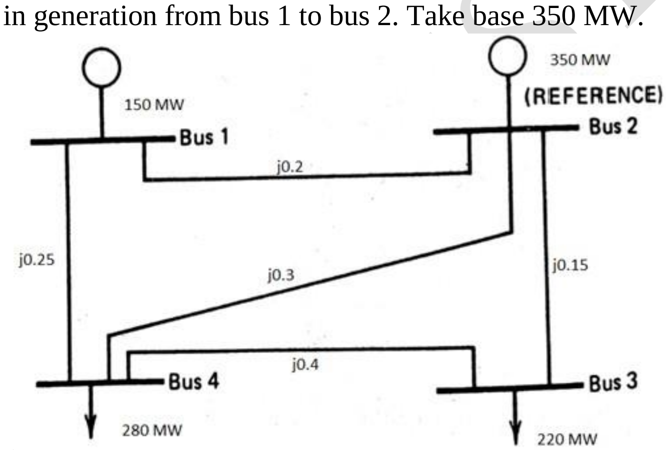
MODEL QUESTION

1	3	0.02+j0.05	j0.04
2	3	0.01+j0.03	0

3. Two generators have the following quadratic fuel-cost functions:
$C_1 = 0.01P_1^2 + 20P_1 + 100$
$C_2 = 0.02P_2^2 + 15P_2 + 120$
The total load is 200 MW. Neglect transmission losses. Formulate the economic dispatch problem and determine the generation schedule using the equal incremental cost principle, subject to:
$50 \leq P_1 \leq 150$, $50 \leq P_2 \leq 150$.

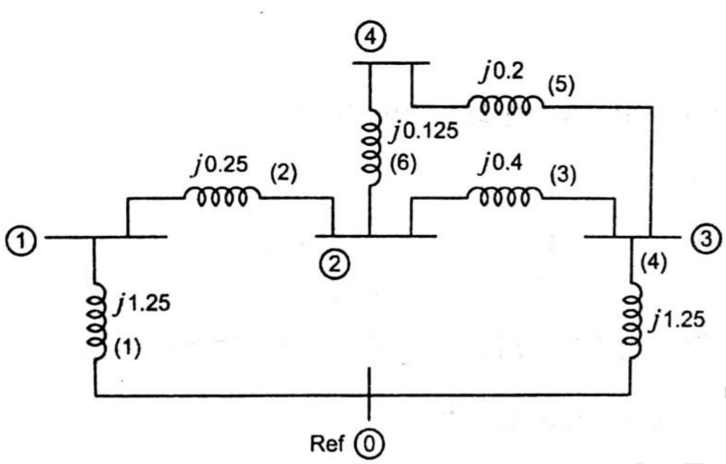
4. Explain Security Constrained Optimal Power Flow (SCOPF). Discuss their applications in power system operation and planning.

5. Figure shows a four-bus power system. Also given below are the impedance data for the transmission lines of the system as well as the generation and load values. Calculate the generation shift sensitivity coefficients for a shift in generation from bus 1 to bus 2. Take base 350 MW.

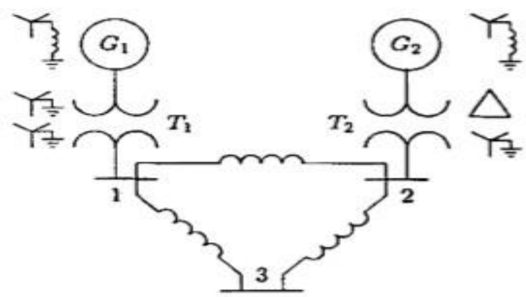


6. Explain the major transmission planning criteria and indices, including N-1 security, thermal loading limits, voltage constraints, Line Loading Index, ATC, VSM, and transmission loss index.

7. Determine bus impedance matrix using bus building algorithm for the network shown where the impedances labeled (1) through (6) are shown in pu preserve all buses on base 100MVA and 20KV.



8. The one-line diagram of a simple power system is shown in figure. The neutral of each generator is grounded through a current-limiting reactor of .25/3 p.u on a 100MVA base. The system data expressed in p.u on a common 100MVA base is tabulated below. The generators are running on no-load at their rated voltage and rated frequency with emfs in phase.
Calculate fault current for line-to-line fault at bus 3 with fault impedance of Zf=j0.1 p.u.



Item	Base MVA	Voltage Rating kv	X1	X2	X0
G1	100	20	0.15	0.15	0.05
G2	100	20	0.15	0.15	0.05
T1	100	20/220	0.1	0.1	0.1
T2	100	20/220	0.1	0.1	0.1
L12	100	220	0.125	0.125	0.3
L13	100	220	0.15	0.15	0.35
L23	100	220	0.25	0.25	0.7125

The End