KADI SARVA VISHWAVIDHYALAYA

B.E. Semester VII

Subject Code:- EE-701 **Subject Name:-:- Interconnected Power System**

Date: 8/11/2016 **Time: 10:30 am to 1:30 pm** **Total Marks:- 70**

Instruction

1. Answer each section in separate Answer sheet.
2. Use of scientific calculator is permitted.
3. All questions are **compulsory.**
4. Indicate **clearly,** the options you attempt along with its respective Question number.
5. Use the last page of main supplementary of **rough work.**

SECTION-I

Q.1

[A] Explain Y_{BUS} using singular transformation method. **[05]**

[B] The following figure 1 shows a simple 4-bus system **[05]**

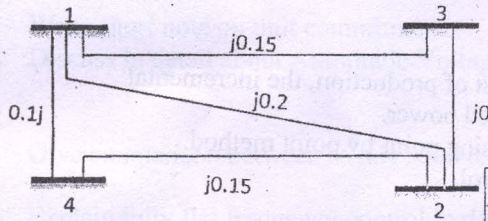


Figure 1

Bus	P_i	Q_i	V_i	Remarks
1	-	-	$1.04\angle 0°$	Slack bus
2	0.5	-	$\lvert V_2 \rvert$ =1.04	PV bus
3	-1.0	0.5	-	PQ bus
4	0.3	-0.1	-	PQ bus

The reactive power limit for bus 2 is $0.25 < Q_2 < 1$ pu. Assuming flat voltage start, find Q_2, voltages at all the buses after the end of first iteration of GS method.

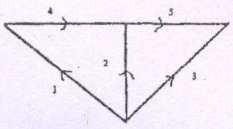
[C] Explain cascade tripping and network islanding in brief. **[05]**

OR

[C] Discuss Z_{BUS} building algorithm. Explain all types of modifications when transmission lines are added between the buses. **[05]**

Q.2

[A] For the given oriented graph of circuit show that (1) $A_b K^T = U$ (2) $B_l = A_l K^T$ **[05]**



[B] What is Interconnected Power System? Describe the advantages and disadvantages of **[05]**

interconnections of power systems in details.

OR

Q.2

[A] Explain primitive network representation in detail [05]

[B] Elaborate: Bus admittance matrix is sparse. [05]

Q.3

[A] Derive static load flow equations. Hence explain classification of buses. [05]

[B] Compare decouple and NR method of load flow [05]

OR

Q.3

[A] Discuss the algorithm of load flow solution using GS method for all type of buses. [05]

[B] Derive equation of jacobian elements for fast decouple load flow method. [05]

SECTION-II

Q.4

[A] Derive an equation coordinating the incremental cost of production, the incremental transmission loss and the incremental cost of received power. [05]

[B] Discuss procedure for solving the swing equation using point by point method. [05]

[C] Explain tie-line load bias method of frequency control. [05]

OR

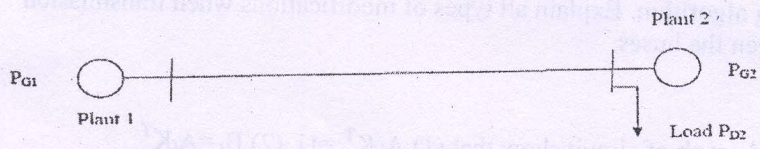
[C] With the help of neat diagram explain turbine speed governing mechanism. [05]

Q.5

[A] Write a short note on swing equation for power system stability. [05]

[B] A two bus system is shown in figure. If 100 MW is transmitted form plant 1 to the load, a transmission loss of 10 MW is incurred. Find the required generation for each plant and the power received by the load when the system λ is Rs 25/MWh. [05]

$\lambda_1 = 0.02\ P_{g1} + 16.0$ Rs/MWh, $\lambda_2 = 0.04 P_{g2} + 20.00$ Rs/MWh



Figure

OR

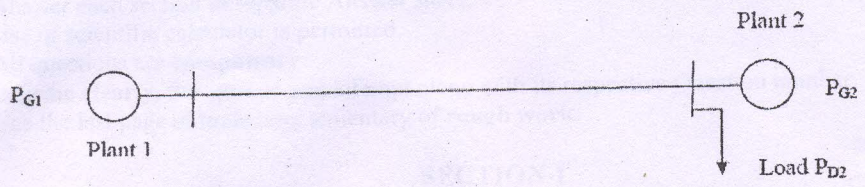
Q.5

[A] Explain equal area criteria of stability. [05]

[B] A system consists of two plants is shown in the fig. If the load of 125 MW is transmitted from plant 1 to the load, there is loss of 12.5 MW. Determine the generation schedule and the load demand if the cost of received power is Rs 70 per MWh. Assume that the incremental costs of two plants are given by, [05]

$\lambda_1 = 0.25\ P_{g1} + 40.0$ Rs/MWh, $\lambda_2 = 0.20 P_{g2} + 50.00$ Rs/MWh

Solve the problem using a) coordination equations b) penalty factor method.



Figure

Q.6

[A] Write short note on unit commitment. [05]

[B] Discuss in detail about Automatic Voltage Regulator. [05]

OR

Q.6

[A] Give comparison between steady state & transient stability. [05]

[B] Explain fully flat frequency control in detail. [05]

----------All the Best ----------

Enrollment No._____

KADI SARVA VISHWAVIDHYALAYA

B.E. Semester-VII

Subject Code:-EE-701 **Subject Name:-**Interconnected Power System

Date:-20/11/2015 **Time:-**10:30 am to 01:30 pm **Total Marks:-**70

Instructions:

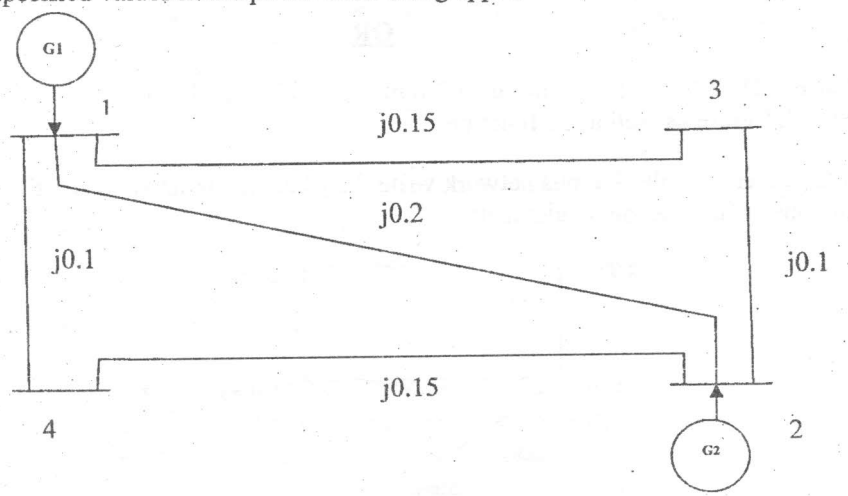
1. Answer each section in separate Answer sheet.
2. Use of Scientific Calculator is permitted.
3. All questions are Compulsory.
4. Indicate Clearly, the options you attempt along with its respective question number.
5. Use the last page of main supplementary for rough work.

Section-I

Q-1 **[A]** What is power system islanding? Why it is needed? What is ideal procedure to restore the grid? Discuss the effects of islanding. **[05]**

[B] Explain formulation of Y_{BUS} using singular transformation. **[05]**

[C] Consider following system wherein line reactances are indicated in pu. The magnitude of all the four bus voltages are 1 pu. The bus powers are given in the table, find unspecified values in the power table using approximate load flow study. **[05]**



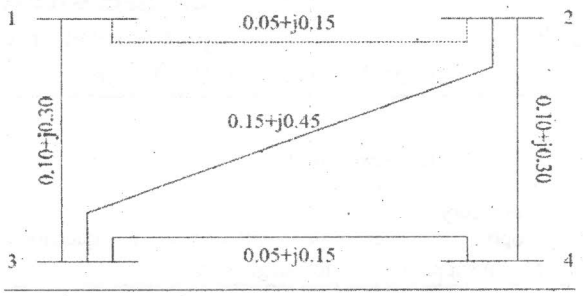
Bus	Real Demand	Reactive Demand	Real Generation	Reactive Generation
1	1	0.5	Unspecified	Unspecified
2	1	0.4	4	Unspecified
3	2	1	0	Unspecified
4	2	1	0	Unspecified

OR

[C] Give reasons: (i) One of the buses is taken as slack bus in load flow studies. (ii) An acceleration factor is commonly used in load flow studies using GS method. **[05]**

Q-2 **[A]** Explain bus incidence matrix and primitive network. **[05]**

[B] The following figure shows a simple 4-bus system with data mentioned in the table. **[05]**



Line no.	G, pu	B, pu
1 – 2	2.000	- 6.0
1 – 3	1.000	- 3.0
2 – 3	0.666	- 2.0
2 – 4	1.000	- 3.0
3 – 4	2.000	- 6.0

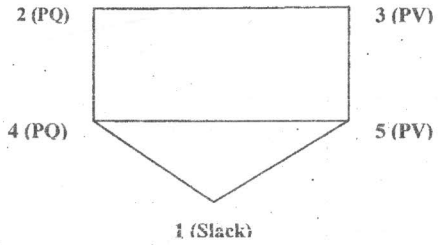
Bus	P_i	Q_i	V_i	Remarks
1	-	-	$1.04\angle 0°$	Slack bus
2	0.5	-	$\lvert V_2 \rvert = 1.04$	PV bus
3	-1.0	0.5	-	PQ bus
4	0.3	-0.1	-	PQ bus

The reactive power limit for bus 2 is $0.2 < Q_2 < 1$. Assuming flat voltage start, find Q_2, V_3, V_4 at the end of first iteration of GS method.

OR

Q-2 **[A]** What is LDC? Write the name of different types of LDC. Explain in detail about Load Dispatch Centre as well as its functions. **[05]**

[B] For the given sample five bus network write the jaccobian matrix. Also write generalized equations to find jaccobian elements. **[05]**



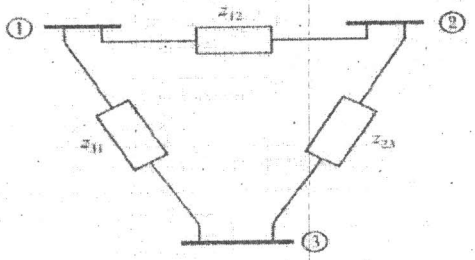
Q-3 **[A]** Discuss the algorithm of load flow solution using Newton-Raphson method for all type of buses. **[05]**

[B] Discuss Z_{BUS} building algorithm. Explain all types of modifications when transmission lines are added between the buses. **[05]**

OR

Q-3 **[A]** Derive the criterion for economic distribution of load between different units of a plant when transmission losses are neglected **[05]**

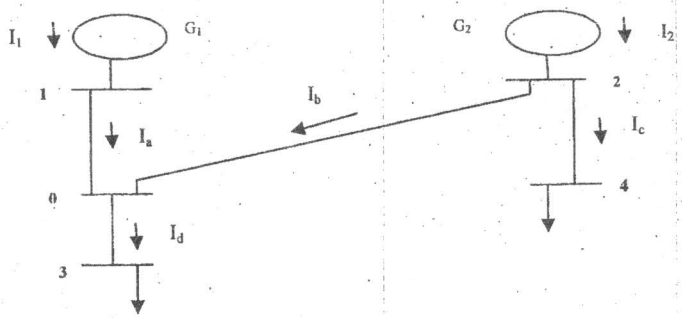
[B] A three bus system is shown in Fig. Each line has series imp of (0.05+j0.15) p.u. and shunt admittance is neglected find [Ybus]. Also find the modified [Ybus] when bus no. 4 is to be added to bus no 3 through a line of Z=0.1+0.3 p.u. **[05]**



Section-II

Q-4 [A] Why frequency control is required in power system? Explain principle of operation for different frequency control methods. [05]

[B] For the shown power system network in fig., branch currents and impedances are : [05]
I_a = 2-j0.5 pu , Z_a = 0.015+j0.06 pu, I_b = 1.6-j04 pu, Z_b = 0.015+j0.06 pu, I_c = 1-j0.25 pu Z_c = 0.01+j0.04 pu, I_d = 3.6-j0.9 pu , Z_d = 0.01+j0.04 pu. Calculate the loss formula coefficients in pu and in reciprocal MW, if base is 100 MVA.



[C] Write short note on unit commitment. [05]

OR

[C] Explain equal area criteria of stability. [05]

[A] Explain tie-line load bias method of frequency control. [05]

[B] Derive the expression for B-coefficients in case of two generating plants connected to an arbitrary number of loads through a transmission network. [05]

OR

Q-5 [A] Discuss procedure for solving the swing equation using point by point method. [05]

[B] A 100 MVA synchronous generator operates on full load at a frequency of 50 Hz .A 40 MW load is suddenly removed from the system. Due to time lag in the governor system, the steam valve begins to close after 0.5 seconds. Determine the change in frequency that occurs in this time. Assume H = 5 MJ/MVA. [05]

Q-6 [A] Prove that synchronizing co-efficient of a machine should be positive for system stability. [05]

[B] Explain any one application of equal area criterion. [05]

OR

Q-6 [A] How can the transient stability of a system be improved? Discuss the traditional as well as new approaches to the problem. [05]

[B] Give comparison between steady state & transient stability. [05]