

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE SEMESTER– VII EXAMINATION – WINTER 2016**

**Subject Code: 2170901****Date: 23-11-2016****Subject Name: Inter Connected Power System****Time: 10.30 am to 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

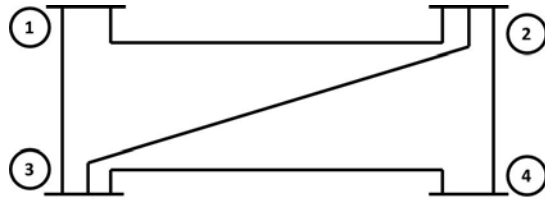
- Q.1** (a) Explain formulation of  $Y_{BUS}$  using direct inspection method. **07**  
 (b) Explain equal area criterion of stability. **07**

- Q.2** (a) State the names of load dispatch centre in hierarchical order and explain its functioning. **07**  
 (b) Derive mathematical formulation for modification in row and column elements of  $Z_{BUS}$  matrix when a link is added to the system. **07**

**OR**

- (b) Explain: Cascade Tripping. **07**
- Q.3** (a) Assuming a flat voltage start, determine the voltages  $V_2$ ,  $V_3$  and  $V_4$  at the end of first iteration using Gauss-Seidel method for the following data. Each of the line has a series admittance of  $2-j4$  pu. Neglect all the shunt admittances. **10**

Bus	$P_i$	$Q_i$	$V_i$
1	-	-	$1.03 \angle 0^\circ$
2	0.5	-0.25	-
3	-1	0.5	-
4	0.3	-0.1	-



- (b) Compare GS method of load flow study with FDLF method. **04**

**OR**

- Q.3** (a) Derive the static load flow equations. On the basis of these equations, explain the classification of buses. **07**  
 (b) Explain clearly with a flow chart the computational procedure for load flow solution using Newton Raphson method. **07**

- Q.4** (a) What is penalty factor? Establish a condition for optimal load dispatch with consideration of the transmission losses. **07**  
 (b) Two generators rated 250 MW and 450 MW are operated in parallel. The droop characteristics of their governors are 3% and 4% from no load to full load respectively from no load to full load. Assuming that the generators are operating at 50 Hz at no load, how would a load of 700 MW be shared between them? What will be the system frequency at this load? **07**

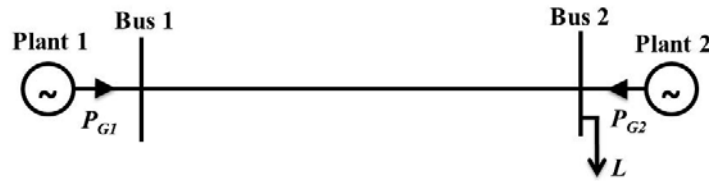
**OR**

- Q.4** (a) With the help of a neat diagram explain turbine speed governing system. Also derive its mathematical model. **07**

- (b) In a two bus system shown in figure, if 125 MW is transmitted from bus 1 to the load at bus 2, a transmission loss of 15.625 MW is incurred. Find the required generation for each plant connected at each bus and the power received by load when the system  $\lambda$  is Rs.24/MWh. The incremental fuel costs of the two plants are given below. 07

$$dC_1/dP_{G1} = 0.025P_{G1} + 15 \text{ Rs/MWh}$$

$$dC_2/dP_{G2} = 0.05P_{G2} + 20 \text{ Rs/MWh}$$



- Q.5 (a) Explain the step by step method of solving swing equation stating clearly the assumptions. 07
- (b) A generator operating at 50 Hz delivers 1 pu power to an infinite bus through a transmission circuit in which resistance is ignored. A fault takes place reducing the maximum power transferable to 0.6 pu whereas before the fault, this power was 1.9 pu and after the clearance of the fault, it is 1.4 pu. By the use of equal area criterion, determine the critical clearing angle. 07

OR

- Q.5 (a) Explain various techniques to improve transient stability of a power system. 07
- (b) A synchronous generator of reactance 1.2 pu is connected to an infinite bus bar ( $|V|=1.0$  pu) through transformer and a line of total reactance of 0.5 pu. The generator no load voltage is 1.2 pu and its inertia constant is  $H=5$  MW-s/MVA. The resistance and machine damping may be assumed negligible. The system frequency is 50 Hz. Calculate the frequency of natural oscillations if the generator is loaded to (i) 60% and (ii) 75% of its maximum power limit. 07

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