

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2017

Subject Code: 2170901

Date:10/11/2017

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.

MARKS

- Q.1**
- (a) What is black out? What are its effects? **03**
- (b) How Y_{BUS} is formed using singular transformation? **04**
- (c) Explain the formation of Bus Impedance Matrix when new branch with some Impedance is added to reference Bus and to an existing Bus. **07**

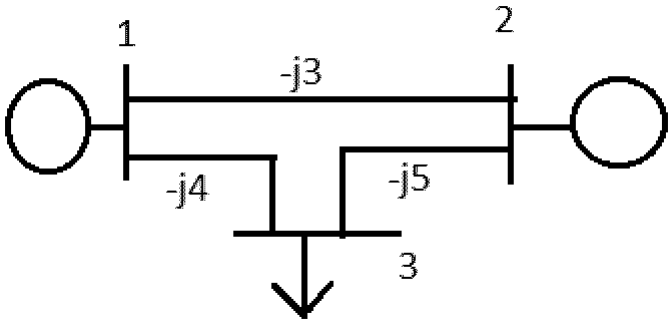
- Q.2**
- (a) What do you mean by flat voltage start and what is importance of acceleration factor in load flow analysis? **03**
- (b) Determine the Bus Admittance Matrix of three Bus power system having following data.(use nodal equation method) **04**

Bus Code i-k	Impedance, Z_{ik}	Line charging $Y_{ik}/2$
1-2	$0.02+j0.06$	$j0.03$
1-3	$0.08+j0.24$	$j0.025$
2-3	$0.06+j0.18$	$j0.020$

- (c) Explain the computational procedure for load flow analysis using N –R method. **07**

OR

- (c) The per unit admittances are indicated in the following diagram and Bus data are given in following table. Determine the voltage at buses 2 and 3 after the first iteration using G-S method .Assume $\alpha =1.6$. **07**



Bus data table:-

Bus No	Bus type	Generation p.u.		Load p.u.		Bus voltage	
		Pg	Qg	Pd	Qd	V	δ
1	Slack	--	--	--	--	1.02	0
2	PQ	0.25	0.15	0.5	0.25	--	--
3	PQ	0	0	0.6	0.3	--	--

- Q.3**
- (a) What are the advantages of FDLF method over NR method? **03**
- (b) Obtain the condition for optimum operation of a power system with ‘n’ plants and considering transmission losses. **04**

- (c) A plant has two generators and are set neither to operate below 20 MW or above 125 MW. Incremental fuel cost of both are :-
 $dC_1/dP_{G1} = 0.15 P_{G1} + 20 \text{ Rs/MWh}$
 $dC_2/dP_{G2} = 0.225 P_{G2} + 17.5 \text{ Rs/MWh}$
For economic dispatch ,find the plant cost of the generated power in Rs/MWh when $P_{G1}+P_{G2}$ equals (1) 40 MW (2)100 MW **07**
- OR**
- Q.3** (a) Classify various types of buses in power system for load flow analysis. **03**
(b) Explain different constrains considered in solving Unit Commitment problem. **04**
(c) The two units to share a load of 225 MW have IFCs as under:- **07**
 $dC_1/dP_{G1} = 0.075 P_{G1} + 15 \text{ Rs/MWh}$
 $dC_2/dP_{G2} = 0.085 P_{G2} + 12 \text{ Rs/MWh}$
Find out (1) most economical load sharing (2) shaving in Rs/hr comparing with equal load sharing.
- Q.4** (a) Why it is necessary to maintain the frequency of the system constant? **03**
(b) Explain P-f and Q-V control loop of power system. **04**
(c) Discuss the application of Equal Area Criteria for stability studies when sudden increase in the load takes place. **07**
- OR**
- Q.4** (a) Differentiate between steady state and transient stability. **03**
(b) Explain Power angle curve of synchronous machine. **04**
(c) What are the methods of Voltage control? Explain any one voltage control method in detail with neat diagram. **07**
- Q.5** (a) What is critical clearing angle and transfer reactance? **03**
(b) The moment of inertia of a 4 pole, 100 MVA, 11 KV, three phase ,0.8 p.f lag ,50 Hz turbo alternator is 10000 Kg.m². Calculate H and M. **04**
(c) Name the methods to obtain the solution of Swing Equation. Explain any one. **07**
- OR**
- Q.5** (a) What is Inertia Constant M and Kinetic Energy N used in stability analysis? **03**
(b) Discuss the factors affecting steady state stability and methods to improve it. **04**
(c) A 50 Hz ,4 pole ,turbo alternator rated 100 MVA ,11 KV has an inertia constant of 8 MJ/MVA, determine **07**
(1)The energy stored in the rotor at synchronous speed.
(2)The rotor acceleration if the mechanical input is suddenly increased to 80 MW for an electric load of 50 MW (neglect electrical and mechanical losses).
