

**GUJARAT TECHNOLOGICAL UNIVERSITY**

**BE- SEMESTER-VI EXAMINATION – WINTER 2025**

**Subject Code:3160920**

**Date:25-11-2025**

**Subject Name:Inter Connected Power System**

**Time:02:30 PM TO 05:00 PM**

**Total Marks:70**

**Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

**MARKS**

- Q.1\***
- (a) What is need of interconnected power system? State its benefits. **03**
- (b) Derive the Static load flow equations. **04**
- (c) Determine the  $Y_{BUS}$  for a 3-bus system as shown in Figure 1. The line series impedances are as follows. **07**

Line (bus to bus)	Impedance (pu)
1-2	$0.06+j0.18$
1-3	$0.03+j0.09$
2-3	$0.08+j0.24$

If each line has a total shunt admittance of  $-j0.5$  p.u. Determine the modified  $Y_{BUS}$  also.

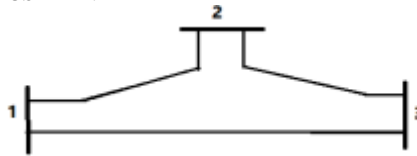


Figure 1

- Q.2**
- (a) Define types of Bus in detail. State the need of slack bus. **03**
- (b) Discuss the main functions of Load Dispatch Centre and its grid arrangement. **04**
- (c) The following is the system data for a load solution. **07**

Bus code	Admittance
1-2	$2-j8$
1-3	$1-j4$
2-3	$0.666-j2.664$
2-4	$1-j4$
3-4	$2-j8$

Bus	$P_g$	$Q_g$	$P_d$	$Q_d$	Bus Voltage
1	?	?	0	0	1.06
2	0	0	0.5	0.2	? (PQ)
3	0	0	0.4	0.3	? (PQ)
4	0	0	0.3	0.1	? (PQ)

Find the bus voltage  $V_2$  and  $V_3$  at the end of first iteration using GS method. Use acceleration factor  $\alpha=1.6$ .

**OR**

- (c) Discuss the Zbus building algorithm. **07**
- Q.3**
- (a) What do you understand by Unit Commitment? **03**
- (b) A system having two generating units connected through a line has the following loss co-efficients, **04**

$$B_{11}=0.1*10^{-2} MW^{-1}$$

$$B_{12}= -0.01*10^{-2} MW^{-1}$$

$$B_{22}=0.13*10^{-2} MW^{-1}$$

Power is being dispatched economically with  $P_1 = 120$  MW and  $P_1 = 200$  MW. To raise the system load by 1 MW cost an additional Rs. 40 per hour. Find the penalty factor of plant 1 and additional cost per hour to increase the output of plant 1 by 1 MW.

- (c) Derive the transmission loss formula explaining current distribution factors. Clearly state all assumptions made in above derivation. **07**

**OR**

- Q.3 (a)** List out the assumptions which are made to carry out approximate load flow study. **03**

- (b) Input–output curve and heat rate curve of generating unit with proper label. **04**

- (c) The fuel costs of a two unit plant are given by **07**

$$C_1 = 100 + 2P_1 + 0.005P_1^2$$

$$C_2 = 200 + 2P_2 + 0.001P_2^2$$

Where  $P_1$  and  $P_2$  are in MW. The plant supplies load of 450 MW. Find economical load scheduling of two units and the incremental fuel cost. Neglect losses.

- Q.4 (a)** Explain the Primitive Network. **03**

- (b) Define critical clearing angle and critical clearing time **04**

- (c) Discuss the procedure of solving swing equation using point by point method. **07**

**OR**

- Q.4 (a)** What do you mean by cascade tripping? **03**

- (b) A two-pole 50 Hz 60 MVA turbo generator has a moment of inertia of  $9*10^3$  Kg-m<sup>2</sup>, **04**

Calculate (i) The kinetic energy, (ii) the inertia constant.

- (c) Find the steady state power limit of a system consisting of a generator equivalent reactance 0.50 pu connected to an infinite bus through a series reactance of 1.0 pu. The terminal voltage of the generator is held at 1.20 pu and the voltage of the infinite bus is 1.0 pu. **07**

- Q.5 (a)** Discuss the factors affecting steady state stability. **03**

- (b) List out the methods of Load Frequency Control and discuss (i) Selective Frequency Control and (ii) Tie Line Load Bias Control. **04**

- (c) With the help of a neat diagram explain turbine speed governing system. **07**

**OR**

- Q.5 (a)** Compare GS and NR method of load flow study. **03**

- (b) Discuss Automatic Generation control (AGC) with block diagram **04**

- (c) Discuss the methods for improving transient stability in a power system in detail. **07**

\*\*\*\*\*