

21819

3 Hours / 100 Marks

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
 - (2) Answer each next main Question on a new page.
 - (3) Assume suitable data, if necessary.

Marks

1. (A) Attempt any THREE :

12

- (a) State the importance of 'bus' in power system.
- (b) List the data required for load flow studies with reference to transformers, transmission lines, buses and generator.
- (c) Explain briefly the relation between real power and frequency of the system.
- (d) State the need of load forecasting in power system operation.

(B) Attempt any ONE :

06

- (a) Develop a Y matrix for the following 3 bus system :

| Bus Code | Line Impedance (P.u.) | Bus Code | Line charging admittance (P.u.) |
|----------|--------------------------|----------|------------------------------------|
| 1 - 2 | $0.08 + j0.32$ | 1 | $j0.02$ |
| 2 - 3 | $0.06 + j0.082$ | 2 | $j0.01$ |
| 1 - 3 | $0.05 + j0.06$ | 3 | $j0.03$ |

- (b) For a simple two bus power system, derive the equation $I_{bus} = Y_{bus} \cdot V_{bus}$.

2. Attempt any FOUR :**16**

- (a) State the need for load flow analysis.
- (b) Derive the equation to prove that the voltage drop across the transmission line is mainly due to reactive power flow.
- (c) List the various methods of voltage control and their field of applications.
- (d) Enlist any four factors which govern the load shedding in a power system.
- (e) State the factors that governs load shedding.
- (f) State & explain different types of buses in Power system.

3. Attempt any FOUR :**16**

- (a) With the help of block diagram, explain load frequency control (single area case).
- (b) List out the information that can be collected from load flow analysis.
- (c) Write the swing equation and define each term in it.
- (d) State and explain factors affecting the transient stability of a power system.
- (e) State and explain the different planning tools used for load forecasting.
- (f) Write down at least four major functions of load dispatch center.

4. (A) Attempt any TWO :**12**

- (a) State the difference between 'Shunt compensation' and 'synchronous compensation'.
- (b) List out the adverse effects of power system instability.
- (c) The incremental fuel curve of 2 units of a generating station are
$$df/dP_1 = 0.6 P_1 + 60 \text{ Rs/MWh}$$
$$df/dP_2 = 0.4 P_2 + 40 \text{ Rs/MWh}$$

Determine load distribution between the two units under economical load dispatch, if the total load on generating station is 600 W.

(B) Attempt any ONE :**06**

- (a) Write SLFE for a two bus system and define its parameters.
- (b) Derive the expression for maximum power flow under steady state condition.

5. Attempt any FOUR :**16**

- (a) State the advantages of reactive power compensation.
- (b) State and explain the terms 'Bus loading' and 'Line flow equations'.
- (c) State the difference between 'power system stability', 'Power system instability', 'Stability limit' and 'overall stability'.
- (d) Draw a neat labelled diagram of turbine speed governing system.
- (e) Draw only a neat labelled schematic diagram for alternator voltage control system.
- (f) Explain, how voltage can be controlled in a power system with the help of transformer.

6. Attempt any FOUR :**16**

- (a) Explain the effect of change in frequency on various consumers.
 - (b) Define the following terms :
 - (i) Steady state stability and its limit.
 - (ii) Transient state stability and its limit.
 - (c) Explain with the help of block diagram working of automatic load frequency control (ALFC) of a synchronous generator.
 - (d) Explain reactive power injection method used for voltage control.
 - (e) State and explain any two methods that can be adopted for the improvement of transient stability condition of a power system.
 - (f) State the significant features of Y bus.
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