

17643

16117

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) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, full marks.

Marks

1. a) **Attempt any THREE of the following:** **12**
- (i) State the significance of bus in power system.
 - (ii) State the advantages of reactive power compensation.
 - (iii) List the data required for load flow studies with reference to transformers, transformer lines, buses and load.
 - (iv) Define the following terms -
 - (1) Steady state stability and its limit
 - (2) Transient state stability and its limit
- b) **Attempt any ONE of the following:** **6**
- (i) For a simple two bus power system derive the equation
$$I_{bus} = Y_{bus} V_{bus}$$

P.T.O.

- (ii) Draw single line diagram of a power system with the following data. Also draw admittance diagram.

Bus to Bus p - q	Line impedance in pu Z_{pq}	Line charging admittance (pu) $Y_{pq/z}$
1 - 2	$0.09 + j0.34$	$j0.01$
2 - 3	$0.06 + j0.08$	$j0.02$
1 - 3	$0.05 + j0.06$	$j0.00$

and calculate self - admittances.

2. Attempt any FOUR of the following:

16

- Explain the relation between real power flow and frequency.
- Explain why the consumers demand constant frequency supply.
- State and explain 'Bus loading' and 'Line flow equations'.
- Write SLFE for a two bus system and define its parameters.
- State the difference between 'Power system stability', 'Power system instability', 'Stability limit' and 'Overall stability'.
- List out the adverse effects of power system instability.

3. Attempt any FOUR of the following:

16

- Prove that reactive power flow through a transmission line causes voltage drop in the line.
- List out the various methods of reactive power compensation and state their field of application.
- State the necessity of load flow analysis referred to power system operation.
- State the informations that can be obtained from load flow studies.
- State the significant features of Y_{bus} .
- Write swing equation and define each term in it.

- 4. a) Attempt any THREE of the following:** **12**
- (i) Derive the expression for maximum power limit under steady state stability condition of a power system.
 - (ii) Draw a labelled schematic diagram of 'Automatic Voltage Control' system.
 - (iii) State the need of load forecasting in power system operation.
 - (iv) List any four factors which govern the load shedding in power system.
- b) Attempt any ONE of the following:** **6**
- (i) What are the different methods of voltage control using transformer ?
 - (ii) State the factors that affect load forecasting.
- 5. Attempt any FOUR of the following:** **16**
- a) State and explain the factors affecting the transient stability of a power system.
 - b) State and explain any two methods that can be adopted for the improvement of transient stability condition of power system.
 - c) Draw and label schematic diagram of load frequency control and excitation voltage control of a turbo generator.
 - d) State and explain the different planning tools used for load forecasting.
 - e) Provide/write the major four functions of load dispatch centre.
 - f) With the help of block diagram explain load frequency control (single area case).

6. Attempt any FOUR of the following:**16**

- a) State the significance of power angle diagram.
- b) State and explain the concept of dynamic stability of a power system.
- c) Explain the turbine governing system for frequency control.
- d) Draw and label the following curve -
 - (i) Incremental fuel cost curve
 - (ii) Fuel cost curve
- e) The cost curve of a power plant having two units are given as
$$\frac{dF}{dP_1} = 0.45p_1 + 40 \text{ Rs/Mwh}$$
$$\frac{dF}{dP_2} = 0.5p_2 + 30 \text{ Rs/Mwh}$$

Determine the fuel cost of each unit of 4500 Mw load is equally distributed on the two units.

- f) Considering the cost curve of two units as given in Q. No. 6(e), determine the fuel cost of each unit if 4500 Mw load is economically distributed.
