Hall Ticket No | | | | | | | | | | |

Question Paper Code: AEEB49

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech VII SEMESTER END EXAMINATIONS (REGULAR) - FEBRUARY 2022
Regulation: R18

POWER QUALITY AND FACTS

Time: 3 Hours **(EEE)** **Max Marks: 70**

Answer FIVE Questions choosing ONE question from each module
(NOTE: Provision is given to answer TWO questions from any ONE module)
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) What is power quality? List and explain the basic steps involved in power quality evaluation. **[7M]**

   (b) Explain interruptions, sag, swell and voltage imbalance. What are the consequences of these PQ problems? **[7M]**

2. (a) Draw and explain the curve to describe the tolerance of mainframe computer equipment to the magnitude and duration of voltage variations on the power system. **[7M]**

   (b) Explain the four major reasons for the increased concern on power quality and summarize on the two different categories of causes for the deterioration in power quality. **[7M]**

MODULE – II

3. (a) Describe the DVR structure with capacitor filter using necessary diagrams. What are its draw backs and how these drawbacks can be overcome? **[7M]**

   (b) Explain the typical DSTATCOM compensator structure in which three separate VSIs are employed. **[7M]**

4. (a) Explain the general equation for generating reference currents for DSTATCOM. **[7M]**

   (b) With relevant diagram explain the left shunt unified power quality conditioner (UPQC) in mitigating the voltage and current harmonics. **[7M]**

MODULE – III

5. (a) What are FACTS controllers? Justify that incorporating FACTS controllers, the power system can be operated close to the boundary of the small signal stability region. **[7M]**

   (b) Explain the principles of conventional reactive power compensators with neat sketch. **[7M]**

6. (a) Classify different types of FACTS controllers. Analyze and choose suitable FACTS controller for integrating renewable energy sources to grid? **[7M]**

   (b) Draw the phasor diagram and derive the expression for active and reactive powers at sending and receiving end of long radial transmission line. Neglecting the transmission line resistance, show that sending end and receiving end active powers are equal. **[7M]**

MODULE – IV

7. (a) Discuss how the controllable VAR can be generated using FC-TCR type SVC. **[7M]**

   (b) Explain with relevant diagrams and equations, the working of TCSC. Analyze why the operation of TCSC should be avoided in the range of $\alpha_{Llim} \leq \alpha \leq \alpha_{Clim}$. **[7M]**.

8. (a) Describe the comparison of SVC and STATCOM with V-I and V-Q characteristics. **[7M]**

   (b) Explain in detail about the role of SVC in enhancing the steady state power limit and power system damping. **[7M]**

MODULE – V

9. (a) Explain how the power transfer capability of line can be doubled by connecting a STATCOM at the midpoint of transmission line. **[7M]**

   (b) Demonstrate the midpoint voltage regulation on a 500-kV transmission line of a static synchronous compensator (STATCOM). **[7M]**

10. (a) How FACTS systems devices are helpful for improving the system stability? Explain about the low frequency oscillations. **[7M]**

    (b) List the main component diagram of a TCSC. Explain single machine infinite bus (SMIB) of TCSC model. **[7M]**

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