APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY **B**

THIRD SEMESTER M. TECH DEGREE EXAMINATION

Electrical and Electronics Engineering

(Power Systems)

04EE 7415—Reactive Power Compensation and Management

Max. Marks : 60 Duration: 3 Hours

PART A

Answer All Questions

Each question carries 3 marks

1. List out the parameters that are needed to be considered while specifying a load compensator.
2. What do you mean by Ferranti effect.
3. What is meant by surge-impedance compensation?
4. Define harmonics. List the effects of harmonics.
5. What are the objectives of reactive power planning.
6. What are the constraints in liberalized transhipment method.
7. What are the advantages of using capacitors?
8. A single phase 400 V, 50 Hz motor takes a supply current of 50 A at a power factor of 0.6. The motor power factor has to be improved to 0.9 by connecting a capacitor in parallel with it. Calculate the required capacity of capacitor in both kVAR and Farads.

PART B

Each question carries 6 marks

9. Prove that power factor can be improved to unity with a compensator.

OR

10. A three-phase system has line-line voltage 11 kV and short circuit capacity of 480 MVA. With compensator gain of 100 pu, determine voltage sensitivity with and without compensator. For each case, if a load reactive power changes by 10 MVARs, find out the change in load bus voltage assuming linear relationship between V-Q characteristics. Also find relationship between compensator and load reactive powers.

11. Derive the expression for power transmitted along an uncompensated line under load and draw the power transmission angle characteristic.

OR

12. Derive the expression for line voltage profile and current profile of an uncompensated line on open circuit. Draw the voltage and current profiles.
13. What are the objectives of series compensation. Explain how series compensation is obtained by means of Midpoint series capacitor and shunt reactors in transmission lines.

OR

14. A 200 km line has midpoint shunt reactor compensation with $B_c/Y_o=X_l/Z_o=\theta=0.4054$ pu. For 100% compensation of the line capacitance $B_\gamma=B_c/2$ = 0.2027 per-unit of Y_o. a) At 500 kV with Z_o=250 Ω, calculate the required compensating shunt reactance, midpoint voltage and terminal reactive powers. b) If the reactor is replaced by a capacitor of equal susceptance, calculate midpoint voltage and terminal reactive powers.
15. Explain the effects of over voltages and under voltages in power system.

OR

16. Explain the transmission benefits to an electric utility on the application of reactive power dispatching strategy.

17. Explain the concept of reactive power management in distribution systems.

OR

18. Explain Reconfiguration methods and Optimizing power flows method used for reduction of losses in power systems.

19. Write note on retrofitting of capacitor banks.

OR

20. Explain the deciding factors in selection of a capacitor.