

(3 Hours)

[Total Marks: 80]

1. Question No.1 is Compulsory

2. Answer any three out of remaining five questions
3. Assume any suitable data wherever necessary and justify the same
4. Illustrate answer with sketches wherever required

- Q.1 Answer all questions
- a) What is reactive power biasing? Explain with V-Q characteristics. 05
 - b) What are the objectives of voltage and phase angle regulators 05
 - c) Explain various parameters which limit loading capabilities of transmission line 05
 - d) An AC supply with an input AC line voltage of 400V at 50 Hz is connected with three-phase three-wire delta connected balanced load having $Z_L = (4.0 + j2.0)$ pu and a base impedance of 5Ω per phase. It is to be realized as a unity power factor load on the AC supply system using shunt connected lossless passive elements (L and/or C) 05
- i) Calculate compensator currents
 - ii) Calculate the values of compensator elements (in farads or Henries)
- Q.2
- a) Explain various types of facts controllers with their objectives in detail 10
 - b) Show that voltage sensitivity for load reactive power is $\frac{dv}{dq} = \frac{-E/SSC}{1 + kr^{\wedge}(E/SSC)}$ 10
- Q.3
- a) Explain power factor correction in single phase systems 10
 - b) Explain switching converter type VAR generator 10
- Q.4
- a) Explain switching converter type series compensation (SSSC) 10
 - b) Explain Thyristor Controlled Phase Angle Regulator (TCPAR) 10
- Q.5
- a) Explain power flow and dynamic stability considerations of a transmission interconnection. 10
 - b) Explain phase balancing and power factor correction of unsymmetrical loads 10
- Q.6
- a) Use phasor diagram to illustrate functioning of UPFC as voltage regulator, line impedance compensator, phase shifter for simultaneous control of voltage, impedance and phase angle 10
 - b) Explain operation and characteristics of Thyristor Controlled Reactor (TCR). What is the condition to obtain Thyristor Switched Reactor (TSR) from TCR 10