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Question Paper Code	14312

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2026

Eighth Semester

Electrical and Electronics Engineering

20EEEL801 - FACTS AND CUSTOM POWER DEVICES

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART – A (i) (MCQ)
(16 × 1 = 16 Marks)
Answer ALL Questions

		Marks	K – Level	CO
1.	The reactive power compensation in transmission linescan be achieved by_____ a) Synchronous condenser b) Transformer tap charger c) Series Resistor c) Circuit Breaker	1	K1	CO1
2.	The primary effect of an uncompensated transmission line on power delivery to the load is to get a) Reduced transmission efficiency and stability b) Improved voltage regulation and efficiency c)Enhanced power factor d) Increased line capacity	1	K1	CO1
3.	The main purpose of controlling reactive power in power transmission lines is a) To increase the speed of the motor b) To reduce the loss of energy in transmission c) To regulate the voltage and maintain system stability d) To enhance the real power transfer capacity	1	K1	CO1
4.	The primary purpose of an SVC in voltage control is_____ a) To increase the voltage during high load conditions b) To decrease the voltage during low load conditions c) To maintain a constant voltage at the bus. d) To regulate frequency across the power system	1	K2	CO2
5.	Interpret the slope of the dynamic characteristics in an SVC help in controlling the voltage? a) It defines the time delay for voltage adjustment b) It controls the rate of change of reactive power with respect to voltage. c) It determines the maximum voltage that can be achieved d) It defines the overall efficiency of the SVC system	1	K2	CO2
6.	A negative slope in the dynamic characteristic of an SVC would typically result in____ a) The SVC absorbing reactive power as the voltage rises b) The SVC supplying reactive power as the voltage rises. c) Improved voltage stability during load shedding d) The SVC maintaining voltage under steady-state conditions	1	K3	CO2
7.	The source of STATCOM's dc voltage usually come from _____. a) An energy-storage capacitor b) A fossil fuel generator c) A piezoelectric device d) A wind turbine	1	K1	CO3
8.	The coupling transformer or interface reactor between the STATCOM and the ac system provides_____. a) Noise reduction b) A high-frequency filter c) A relatively small reactance d) Capacitive balancing	1	K2	CO3
9.	When the converter-operated STATCOM supplies reactive-output power, then the real power provided by the dc source is a) Positive b) Zero c) Equal to the reactive-output power d) Negative	1	K3	CO3

10.	The operations of Converter 1 and Converter 2 synchronized in IPFC by _____. a) a single phase-locked loop to a common line current. b) two independent phase-locked loops to line currents i1 and i2. c) direct communication link between the two converters. d) manually adjusting the synchronization settings.	*1*	*K3*	*CO4*
11.	Upon detecting generator deceleration characterized by dδ/dt<0, how does the SSSC control system respond? a) The series-capacitive compensation is increased. b) The signal Vdr* instructs the SSSC to inject real power into the system. c) It compares the measured current with the reference value. d) The SSSC-output voltage component in quadrature with the line current is regulated.	*1*	*K2*	*CO4*
12.	If Converter 1 of an IPFC is the 'prime' converter and it becomes out of service, how can Converter 2 maintain system operation according to the IPFC control structure? a) Converter 2 can continue to provide independent series reactive compensation by using its own phase-locked loop synchronized to line current i2. b) Converter 2 will switch to control both real and reactive power of Line 1. c) Converter 2 cannot maintain the system operation and will shut down automatically. d) Converter 2 will reverse its injected voltage vector to compensate for Converter 1.	*1*	*K3*	*CO4*
13.	The UPQC manage to regulate the load bus voltage by _____. a) injecting variable active voltage in phase with the source current b) providing long-term energy storage solutions c) enhancing the power factor of the system d) increasing the voltage level for high-capacity transmission	*1*	*K3*	*CO5*
14.	The primary function of a Dynamic Voltage Restorer (DVR) is _____. a) to increase power generation efficiency b) to compensate for voltage sags and swells c) to reduce the cost of electricity d) to enhance the physical security of power systems	*1*	*K1*	*CO5*
15.	The primary objective of designing damping controllers in power systems is to _____. a) To increase the power transfer capacity b) To improve system stability by damping oscillations c) To reduce the overall cost of electricity d) To enhance the efficiency of power generation	*1*	*K2*	*CO6*
16.	In the context of FACTS, the advantage of using online learning algorithms in adaptive controllers _____. a) eliminate the need for any form of feedback mechanism. b) can improve control strategies in real-time by learning from the system's current state and performance. c) Significantly reduce the computational power needed for control. d) Online algorithms are solely used for their ability to operate without internet connectivity.	*1*	*K3*	*CO6*

PART – A (ii) (Short Answer Questions)
(6 × 3 = 18 Marks)
Answer ALL Questions

17.	Determine the need of reactive power control in power transmission lines.	*3*	*K3*	*CO1*
18.	Analyze how the SVC prevents the reactive power rating, reaching its limit too frequently.	*3*	*K4*	*CO2*
19.	Distinguish between STATCOM and SVC.	*3*	*K3*	*CO3*
20.	Examine the applications of UPFC.	*3*	*K4*	*CO4*
21.	Analyze the main components of an IUPQC.	*3*	*K4*	*CO5*
22.	Compute the controller phase index.	*3*	*K3*	*CO6*

PART - B (Descriptive Answer Questions)
(6 × 11 = 66 Marks)
Answer ALL Questions

23.	a)	Compute the real and reactive power in ac system and sketch the instantaneous power waveforms.	*11*	*K3*	*CO1*
		OR			
	b)	Determine the effect of shunt and series compensation on power transmission capacity of a short symmetrical transmission line.	*11*	*K3*	*CO1*
24.	a)	Construct the block diagram for different modes of operation of TCSC and analyze with examples.	*11*	*K4*	*CO2*
		OR			
	b)	Develop the design of SVC voltage regulator and examine the influence of an SVC on system voltage.	*11*	*K4*	*CO2*
25.	a)	Construct and design a STATCOM with its working principle, components, and applications.	*11*	*K3*	*CO3*
		OR			
	b)	Design the steady state model of STATCOM with a neat diagram.	*11*	*K3*	*CO3*
26.	a)	Analyze the different protection schemes of UPFC with neat diagrams.	*11*	*K4*	*CO4*
		OR			
	b)	Sketchthe schematic diagram of an interline power flow controller and examineits basic operating principles.	*11*	*K4*	*CO4*
27.	a)	Sketch a DVR and describe its working principle and operation for sag mitigation?	*11*	*K3*	*CO5*
		OR			
	b)	Sketch the schematic diagram of a right shunt UPQC and outlineits working principle.	*11*	*K3*	*CO5*
28.	a)	Justify how the power system stabilizers (PSS) and FACTS devices can improve stability by influencing the swing mode.	*11*	*K5*	*CO6*
		OR			
	b)	Model different types of adaptive control strategies for FACTS devices with examples.	*11*	*K5*	*CO6*