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Question Paper Code: BPEB07



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER

M.Tech I Semester End Examinations, November- 2019

Regulations: R18

REACTIVE POWER COMPENSATION AND MANAGEMENT

(ELECTRICAL POWER SYSTEMS)

Time: 3 hours

Max. Marks: 70

Answer ONE Question from each

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT- I

1. a) Discuss the following objectives of load compensation: [7M]
 - (i) Power factor correction
 - (ii) Improvement of voltage regulation
 - (iii) Load balancing.
- b) Illustrate with an example, load compensator as a power factor correction of un symmetrical loads. [7M]
2. a) How power factor correction and voltage regulation can be achieved by means of compensation in 1-phase systems. [7M]
- b) Prove that any unbalanced linear ungrounded three phase load can be transformed into a balanced, real three-phase load without changing the real power exchange between source and load. [7M]

UNIT – II

3. a) Explain uniformly distributed fixed compensation in transmission lines and how it effects the [7M]
 - i) voltage control
 - ii) Line-charge reactive power
 - iii) Maximum power of the line?
- b) Describe briefly about the switched shunt reactor compensation for uncompensated transmission line. [7M]
4. a) Illustrate briefly the following [7M]
 - a) Virtual- Z_0 (Surge impedance compensation)
 - b) Virtual- θ (Line-length compensation)
 - c) Compensation by “Sectioning”.
- b) Explain the effect of TCR during a voltage depression and during a voltage rise at the midpoint bus of a symmetrical line. [7M]

UNIT – III

5. a) Give a detailed algorithm for optimum dispatch of reactive power with the help of a flow chart. [7M]
- b) Explain how Reactive Power Management or Planning is obtained by means of mathematical modeling. Define Reactive Power Management. [7M]
6. a) Describe the effects of harmonics and radio frequency on reactive power compensation [7M]
- b) Draw the reactive power characteristics and also explain with neat figures and circuit diagrams? [7M]

UNIT – IV

7. a) Write short notes on: [7M]
a) Explain the different types of Power Tariffs.
b) Explain the load patterns in demand side management.
- b) Explain Reconfiguration methods and Optimizing power flows method used for reduction of losses in power systems. [7M]
8. a) Explain Reconfiguration methods and Optimizing power flows method used for reduction of losses in power systems. [7M]
- b) What are the different load patterns available and also explain the basic methods of load shaping? [7M]

UNIT – V

9. a) What is the purpose of using capacitors on user side for reactive power management? What are the deciding factors for the selection of capacitors? [7M]
- b) Briefly discuss how to select a capacitor for user side reactive power management. [7M]
10. a) Explain how the harmonics are produced in an electric arc furnace. [7M]
- b) Discuss how a user side reactive power management is found by means of capacitors [7M]



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COURSE OBJECTIVES:

The course should enable the students to:

I	Explain the necessity of reactive power compensation
II	Describe load compensation
III	Understand the various types of reactive power compensation in transmission systems
IV	Illustrate reactive power coordination system
V	Discuss distribution side and utility side reactive power management.

COURSE OUTCOMES (COs):

CO 1	Understand objectives specifications of load compensation.
CO 2	Analyze steady state reactive power compensation in transmission system
CO 3	Understand reactive power coordination circuit analysis of balanced and unbalanced networks.
CO 4	Understand demand side management.
CO 5	Understand user side reactive power management.

COURSE LEARNING OUTCOMES (CLOs):

BPEB07.01	Understand objectives specifications of load compensation
BPEB07.02	Examine how load compensator as a voltage regulator
BPEB07.03	Analyze phase balancing and power factor correction of unsymmetrical loads examples.
BPEB07.04	Understand types of compensation
BPEB07.05	Analyze examples transient state reactive power compensation in transmission systems
BPEB07.06	Understand objective, mathematical modeling, operation planning, transmission benefits
BPEB07.07	Understand basic concepts of quality of power supply, disturbances steady, state variations.
BPEB07.08	Examine Effects of under voltages, frequency, harmonics, radio frequency and electromagnetic interferences.
BPEB07.09	Understand Load patterns, basic methods load shaping.
BPEB07.10	Describe power tariffs KVAR based tariffs penalties for voltage flickers and Harmonic voltage levels.
BPEB07.11	Understand Distribution side reactive power management.
BPEB07.12	Examine Economics planning capacitor placement, retrofitting of capacitor banks.
BPEB07.13	Purpose of using capacitors, selection of capacitors, deciding factors, types of available capacitor, characteristics and Limitations.
BPEB07.14	Understand Reactive power management in electric traction systems and arc furnaces.

MAPPING OF SEMESTER END EXAMINATION TO COURSE OUTCOMES

SEE Question No	Course Learning Outcomes		Course Outcomes	Blooms Taxonomy Level	
1	a	BPEB07.01	Understand objectives specifications of load compensation	CO 1	Understand
	b	BPEB07.02	Examine how load compensator as a voltage regulator	CO 1	Remember
2	a	BPEB07.03	Analyze phase balancing and power factor correction of unsymmetrical loads examples.	CO 1	Analyze
	b	BPEB07.03	Analyze phase balancing and power factor correction of unsymmetrical loads examples.	CO 1	Analyze
3	a	BPEB07.04	Understand types of compensation	CO 2	Analyze
	b	BPEB07.05	Analyze examples transient state reactive power compensation in transmission systems	CO 2	Analyze
4	a	BPEB07.04	Understand types of compensation	CO 2	Understand
	b	BPEB07.05	Analyze examples transient state reactive power compensation in transmission systems	CO 2	Analyze
5	a	BPEB07.06	Understand objective, mathematical modeling, operation planning, transmission benefits	CO 3	Understand
	b	BPEB07.07	Understand basic concepts of quality of power supply, disturbances steady, state variations.	CO 3	Understand
6	a	BPEB07.08	Examine Effects of under voltages, frequency, harmonics, radio frequency and electromagnetic interferences.	CO 3	Remember
	b	BPEB07.08	Examine Effects of under voltages, frequency, harmonics, radio frequency and electromagnetic interferences.	CO 3	Remember
7	a	BPEB07.09	Understand Load patterns, basic methods load shaping.	CO 4	Understand
	b	BPEB07.10	Describe power tariffs KVAR based tariffs penalties for voltage flickers and Harmonic voltage levels.	CO 4	Understand
8	a	BPEB07.11	Understand Distribution side reactive power management.	CO 4	Understand
	b	BPEB07.12	Examine Economics planning capacitor placement, retrofitting of capacitor banks.	CO 4	Remember
9	a	BPEB07.13	Purpose of using capacitors, selection of capacitors, deciding factors, types of available capacitor, characteristics and Limitations.	CO 5	Understand
	b	BPEB07.14	Understand Reactive power management in electric traction systems and are furnaces.	CO 5	Understand
10	a	BPEB07.13	Purpose of using capacitors, selection of capacitors, deciding factors, types of available capacitor, characteristics and Limitations.	CO 5	Understand
	b	BPEB07.14	Understand Reactive power management in electric traction systems and are furnaces.	CO 5	Understand

Signature of Course Coordinator

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