D 41384 (Pages : 2)

EIGHTH SEMESTER B.TECH. (ENGINEERING) [2014 SCHEME] DEGREE EXAMINATION, APRIL 2018

Electrical and Electronics Engineering

EE 14 802—FACTS CONTROLLERS AND CUSTOM POWER DEVICES

Time : Three Hours   Maximum : 100 Marks

Part A

I. Answer any *eight* questions out of *ten* :

1 What are FACTS controllers ? What are their benefits ? Explain different types of FACTS controllers with examples.

2 With a neat circuit diagram, explain the basic operation of a voltage sourced converter.

3 List different methods for controllable var generation.

4 Explain the operation of Thyristor-Controlled Reactor (TCR).

5 Draw and discuss the V-l characteristics of SVC.

6 With relevant phasor diagrams and characteristics, discuss the concept of series capacitive compensation.

7 What is UPFC ? Explain its principle of operation.

8 Discuss how power flow can be controlled in parallel paths.

9 List and explain different high power devices used in FACTS devices with their voltage and current ratings.

10 What are harmonics ? Explain the need for the mitigation of harmonics.

(8 × 5 = 40 marks)

Part B

II. Answer *all* questions :

11 With circuit diagram and waveforms, explain the operation of ThyristorSwitched Reactor (TSR).

Or

12 With the help of circuit diagram and waveforms, discuss the application of TSSC for series compensation. Also represent their V-I characteristics.

Turn over

13 Explain how improvement in voltage stability, Transient stability, Power Oscillation damping and Sub Synchronous resonance damping can be achieved using an SSSC. Also explain why it is immune to sub synchronous resonance problems.

Or

14 (i) What is the need of UPFC instead of separate controllers ?　　　　(7.5 marks)

(ii) Explain the basic operating principle of IPFC.　　　　(7.5 marks)

15 Explain the operation of a three-phase full wave bridge converter. Draw the necessary waveforms.

Or

16 Show that the steady state transmittable power can be increased and the voltage profile along the line can be controlled by suitable reactive shunt compensation.

17 Derive equations for real and reactive power flow using a UPFC. Clearly explain the improvement in attainable real power and receiving-end reactive power demand.

Or

18 Explain in detail the operation of Unified Power Quality Conditioner.

(4 × 15 = 60 marks)