Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS NOV/DEC 2016

SUBJECT: HVDC & FACTS [ELE 433]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 25 November 2016** **MAX. MARKS: 50**

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitable assumed.

1 A. A 450Km long transmission line, with a 220KV, 100MVA synchronous generator at one end is used to drive a unity power factor load. Determine the voltage and current at 450Km from the synchronous generator if the line is transmitting a) 70MW and b)100MW.

The transmission line parameters are l=2mH/Km and c=15nF/Km.

Find the surge impedance load of the transmission line. ***(05)***

1 B. Draw the equivalent circuit model of a STATCOM and explain the advantages of STATCOM over SVC. ***(05)***

2 A. A 400KV, 50 Hz symmetrical transmission line is compensated by connecting an SVC in shunt at the midpoint of the line. Design the SVC to maintain uniform voltage throughout the transmission line having length of 250Km. The line parameters are l=2mH/Km and c=15nF/Km. ***(05)***

2 B. A 3 phase full bridge inverter is controlled by 120˚ conduction mode, draw the circuit diagram and explain its operating principle. Draw the waveforms of any one line voltage, pole voltage and phase voltage. ***(05)***

3 A. Draw a schematic diagram and explain how the SVC is controlled to maintain a uniform voltage at the midpoint of the line ***(05)***

3 B. Draw the circuit diagram of a TCSC (FC-TCR) configuration and explain its operation. ***(05)***

4 A. A 22KV, 50Hz symmetrical line of length 150Km is operated at the rated voltage. A SSSC is connected at the midpoint of the line. If δ is 25˚, find the voltage that has to be injected by the SSSC (V_{SSSC}) to transfer 5MW power through the line. The line parameters are l=1mH/Km and c=11.1nF/Km. ***(05)***

4 B. Draw the circuit diagram of a Static Phase Shifter connected to the transmission line. Explain its operation with the help of relevant phasor diagrams. ***(05)***

5 A. Compare HVAC and HVDC with respect to long distance power transmission ***(05)***

5 B. A six pulse converter operated at a firing angle (α) of 20˚. The leakage reactance of the transformer is 15Ω. The input line to line AC voltage is 85KV. Compute the overlap angle and the average output voltage if the output current is a) 1000A and b) 1500A ***(05)***

6 A. Draw the equivalent circuit diagram of the HVDC system and explain the inverse cosine control scheme. ***(05)***

6 B. Explain the faults that could occur in HVDC system converters. ***(05)***