

**M. TECH.-I (ELECTRICAL -POWER SYSTEM) (CBCS – 2015
COURSE) : SUMMER - 2018
SUBJECT : FACTS AND HVDC**

Day : **Wednesday**
Date : **30/05/2018**

S-2018-2987

Time : **11.00 AM TO 02.00 PM**
Max. Marks : 60

N. B. :

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in the **SEPARATE** answer books.
- 4) Draw neat and labeled diagram **WHEREVER** necessary.
- 5) Use of non-programmable **CALCULATOR** is allowed
- 6) Assume suitable data, if necessary.

SECTION - I

Q. 1 Explain in details how the FACTS controllers are classified. Draw suitable figures. (10)

OR

What are the dc link converter topologies? Discuss the control issues in power converters. (10)

Q. 2 Explain the operation of SSSC with help of neat block diagram and control characteristics. (10)

OR

A 400 kV, 50Hz, 600 km long symmetrical line is operated at the rated voltage. (10)

- a) What is the theoretical maximum power carried by the line? What is the midpoint voltage corresponding to this condition?
- b) A series capacitor is connected at the midpoint of the line to double the power transmitted. What is its reactance?
- c) A shunt capacitor of value 450 ohms is connected at the midpoint of the line. If the midpoint voltage is 0.97, compute the power flow in the line corresponding to this operating point.
Data: $|L| = 1 \text{ mH/km}$, $C = 11.1 \cdot 10^{-9} \text{ F/km}$

Q. 3 Explain how UPFC can independently control real and reactive power flow with neat diagram. (10)

OR

Explain the operation of UPFC when connected at sending end. (10)

SECTION - II

Q. 4 Derive the expression for power at sending end and receiving end of HVDC pole, in terms of sending end and receiving end voltage and line resistance R. Compare the equation with power flow equation in AC transmission line. (10)

P. T. O.

OR

Q. 4 a) What are the merits of back to back HVDC interconnection over conventional AC interconnection? **(05)**

b) Describe the effect of overlap angle in rectifier operation with waveform and mathematical equation. **(05)**

Q. 5 What is the principle of HVDC circuit breaker? Describe with neat diagram and waveforms. If dc fault current is 5 kA and inductance of dc pole is 2 Henry. What is the switching energy dissipated in circuit breaker? **(10)**

OR

Describe MTDC system control in parallel connected converters with neat diagram and control characteristics. **(10)**

Q. 6 Draw block diagram of Hierarchical levels of controls of HVDC transmission system and describe function of each level. **(10)**

OR

Explain the method adopted in matching DC voltages and DC currents in two terminal of an HVDC system. Show operating point on the characteristics of rectifier and inverter. **(10)**

* * * * *

300518-m-engineering-pune