PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
MID TERM EXAMINATION - APR 2023

Semester : Semester VI - 2020

Course Code : EEE3021

Course Name : Sem VI - EEE3021 - Discipline Elective-IV: Flexible A. C Transmission Systems Facts

Program : EEE

Date : 15-APR-2023

Time : 9.30AM - 11.00AM

Max Marks : 60

Weightage : 30%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS   (5 X 2 = 10M)

1. In tie lines of short lengths, the power flow can be controlled by introducing _____ which has a complex turns ratio with magnitude of unity
   a) Power Transformer   (CO1) [Knowledge]
   b) Current Transformer
   c) Phase Shifting Transformer
   d) Voltage Transformer

2. Depending on the Power electronic devices used in the control, the FACTS devices can be classified as _____
   a) Variable capacitance type   (CO1) [Knowledge]
   b) Variable inductance type
   c) Variable Rectifier type
   d) Voltage source converter type

3. SVC is a variable impedance device where the current through a reactor is controlled using back to back connected _____
   a) Thyristor Valves   (CO1) [Knowledge]
   b) MOSFETs
   c) BJTs
   d) None of these

4. VSCs require self-commutated power semiconductor devices such as _____ (with higher costs and losses) unlike in the case of variable impedance type SVC which use thyristors devices.

(CO2) [Knowledge]

a) Gate Turn on Thyristors
b) Gate Turn off Thyristors
c) Insulated Gate bipolar thyristor
d) None of these

5. The use of series capacitors is generally the most economic solution for enhancing power flow. However, the problem of _____ has deterred system planners from going in a big way for series compensation.

a) Sub Synchronous Resonance
b) Sub Synchronous Reactance
c) Switched Synchronous Reactance
d) Switched Synchronous Resonance

(CO2) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS   **(2 X 15 = 30M)**

6. The major application of SVC is for rapid voltage regulation and control of dynamic (temporary) overvoltages caused by load throw off, faults or other transient disturbances. The dynamic reactive control at the load bus increases power transfer and can solve the problem of voltage instability (collapse) caused by contingency conditions. It is to be noted that steady state voltage regulation can be achieved by mechanically switched capacitors and reactors (MSC and MSR). However, fast voltage regulation is required to prevent instability under transient conditions. By referring to the above statememts, Discuss about the controller design of SVC by drawing the block diagram of the controller.

(CO1) [Comprehension]

7. A STATCOM is comparable to a Synchronous Condenser (or Compensator) which can supply variable reactive power and regulate the voltage of the bus where it is connected. In comparing SC and STATCOM, we note that while rotation of the DC field winding on the rotor results in the generation of AC voltages in the stator windings through magnetic induction, the synchronous operation of the switches in a STATCOM results in the AC voltage at the output. Unlike in a SC, this output voltage also contains many harmonics and some solution has to be found to eliminate them. The diagram of Single phase STATCOM is given below. Discuss about the operation of T1, T2, D1 and D2 for different modes.
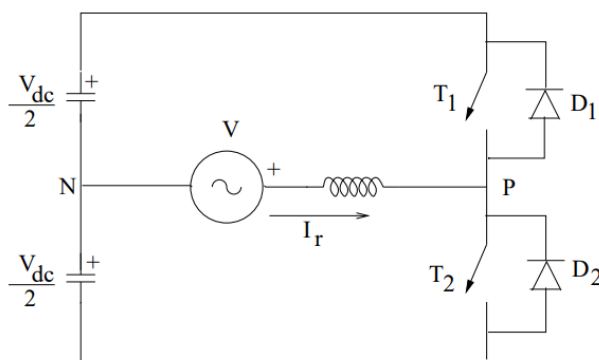
(CO2) [Comprehension]

PART C

ANSWER THE FOLLOWING QUESTION   **(1 X 20 = 20M)**

8. For stability studies it is not necessary to model the gate pulse unit and the generation of gate pulses. It is adequate to assume that the desired value of TCSC reactance is implemented within a well defined time frame. The value of TT CSC is from 15 to 20 ms. Xref is determined by the power scheduling controller or in its absence, by manual control based on order from load dispatch.Explain the block diagram of TCSC Controller after drawing in brief

(CO2) [Application]