MATURI VENKATA SUBBA RAO(MVSR) ENGINEERING COLLEGE
(Sponsored by Matrusri Education Society, Estd. 1980)
Affiliated to Osmania University & Approved by AICTE
NBA Accredited for Civil, CSE, EEE, ECE, Mechanical & IT B.E. Courses
Nadergul, Hyderabad - 501510
EAMCET, PGECET & ICET Counselling Code: MVSR

Roll Number:

Note: Candidate to fill items carefully

2	4	5	1	-	1	8	-	1	3	4	-	0	2	5

B.E. VII Semester Branch: EEE Internal Examination: 1 / 2

Subject: PE-AP's Date of Examination: 3/2/22

Name of the Student: Vandana Patel Signature:

Q. No.	1	2	3	4	5	6	7	8	9	10	Total
MARKS											

Name & signature of the Valuer with date:

START WRITING FROM HERE

Part-A

1) Inter line Power flow Controller :-

The Interline power flow controller (IPFC) is a voltage source converter-based flexible AC transmission system (FACTS) controller which can inject a voltage with controllable magnitude and phase angle at the line frequency thereby providing compensating among multiple transmission lines.

2 Marks> Types of DC links :-

1) Monopolar links
2) Bipolar links
3) Homopolar links.

3 Marks Application of HVDC :-

1) Connects multiple DC renewable energy farms to multiple power grids.
2) Connecting multiple offshore wind farms to the power grid.
3) Transfer of bulk power from multiple remote AC generating stations to multiple load centers.
4) Allow interconnection b/w two asynchronous AC power systems.

Part-B

6 aout> **Firing angle Control :**

The operation of CC and CEA controllers is closely linked with the method of generation of gate pulses for the values in a converter. The requirements for the firing pulse generator of HVDC value are

1) The firing instant for all the values are determined at ground potential and the firing signal sent to individual thyristors by light signal through fibre-optics cables. The required gates power is made available at the potential of individual thyristor.

2) While a single pulse is adequate to turn-on a thyristor, the gate pulse generated must send a pulse whenever required if the particular value is to be kept in a conducting state.

The two basic firing schemes are

(i) Individual phase control (IPC)

(ii) Equidistant Pulse Control (EPC)

IPC :-

This was used to generate firing pulse for each phase that are independent of each other and are rigidly synchronized with commutation voltages.

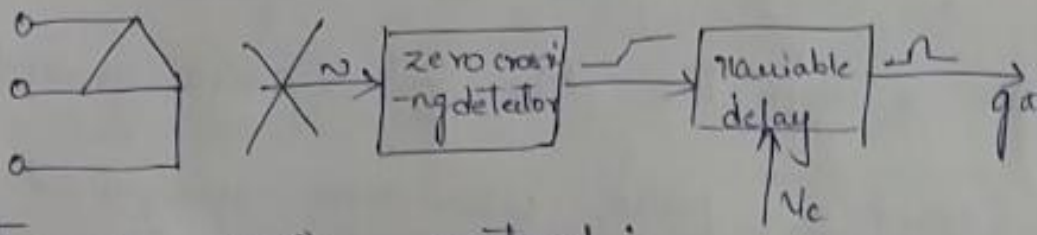
This acheived in two ways :-

(a) Constant α control

(b) Inverse cosine Control.

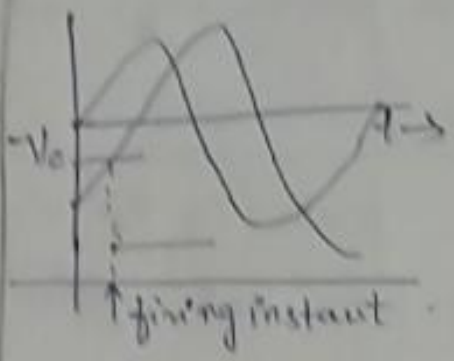
⇒ Constant α Control :-

· six timing voltages are derived from the converter AC bus via voltage transformer.



⇒ Inverse cosine control :-

The six timing voltages are each phase shifted by 90° and seperately added to common control voltage V



The main advantages of this scheme is that the average DC voltage across the bridge varies linearly with the control voltage Ve

Eg: distant pulse control is written in page 10

6 bars Comparision between Series and Parallel HVDC System :-

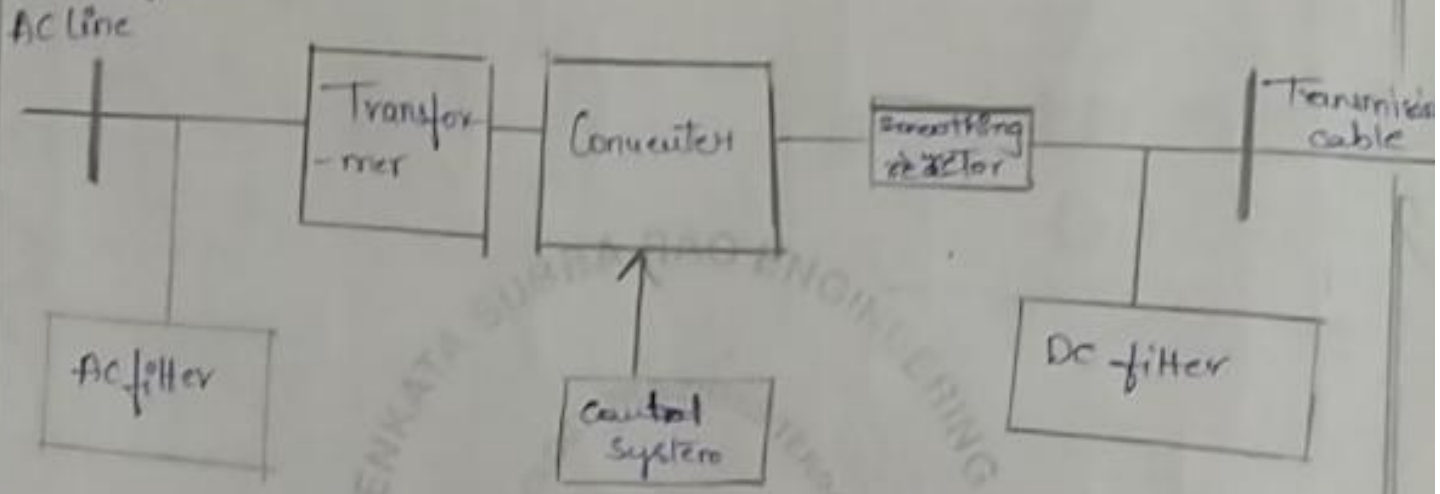
Series HVDC System	Parallel HVDC system
1) High speed reversal of power is possible in series system w/o mechanical switching.	1) High speed reversal of power is not possible in parallel system.
2) The value voltage rating in a series is related to the power rating	2) The current rating in a llel system is related to power rating
3) For small power rating of the tap : series system may be cheaper even though value have to be insulated.	3) The parallel connection has the advantage of staged development in the converter stations by adding llel circuits

Series ~~System~~ HVDC	Parallel HVDC
To full voltage to ground.	as the power req increases
4) There are increased losses in the line and value in series system.	4) The losses in the line and value in ||el system is less compared to series syste
~~In comparision to~~	
5) Insulation co-ordination is a problem in series system.	5) Insulation co-ordination is not an issue in ||el system.
6) The fault in a line section would lead to complete shutdown in a series connected system	6) ||hile in ||el system it would lead to ~~complete~~ shutdown of a converter station connected to the line section.
7) The control and protection philosphy in a series HVDC system is a natural extension of the two terminal system.	7) In parallel HVDC extension is not straight-forward.
8) Series connection is appropiate for taps of rating less 20% of the major inverter Terminal.	8) Parallel connections are more versatile and are mostly used as in AC systems

Ans:

(a) HVDC converter System:

Layout:

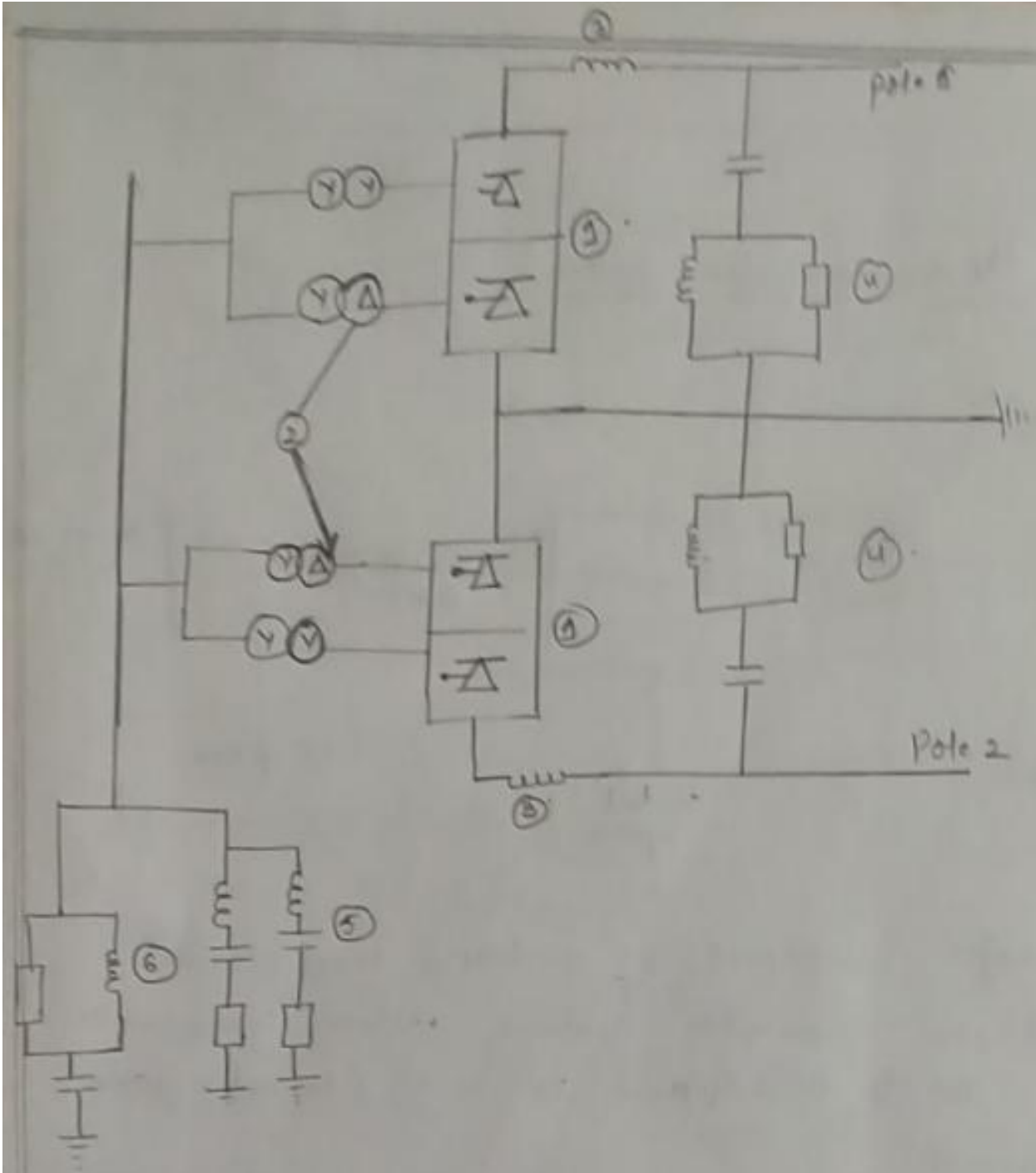


⇒ The major component of a HVDC transmission system are converter stations where conversion from AC to DC (rectifier) and DC to AC (Inverter) are performed.

⇒ A point to point transmission requires two converter stations.

⇒ The role of rectifier and inverter station can be reversed by suitable converter control.

⇒ A typical converter station with two 12 pulse converter unit pole is shown :-



1. 12 pulse converter
2. Transformer
3. Smoothing reactor
4. Dc filters
5. Tuned AC filter
6. HP AC filters

5 bars⇒

AC system	DC systems
1) The AC Transmission systems transmit the alternating current.	1) The DC transmission system is used for transmitting Direct current
2) It has 3 conductors (Red, Yellow and blues ones)	2) This system has only 2 conductors (the +ve -ve)
3) It contains Inductances and surges	3) It does not contain Inductance and surges
4) The construction of AC line is more complicated	4) The construction of DC is less complicated.
5) In AC system electric power can easily generate at high voltage.	5) In DC systems electric power cannot easily generate at high voltage due to commutation problem.
6) It requires more insulation due to more conductors	6) It requires less insulation due to less conductors.
7) The AC system can easily use or decrease voltage level using step up and step-down transformer.	7) for DC system use of use of voltage level is done using Chopper and booster.
8) Corona losses mostly exist in this system.	8) Corona losses rarely exist in HVDC system.

Gaur Continuation :

(b) Equidistant pulse control :

The firing pulse are generated in steady state at equal intervals of 1/pf through a ring counter.

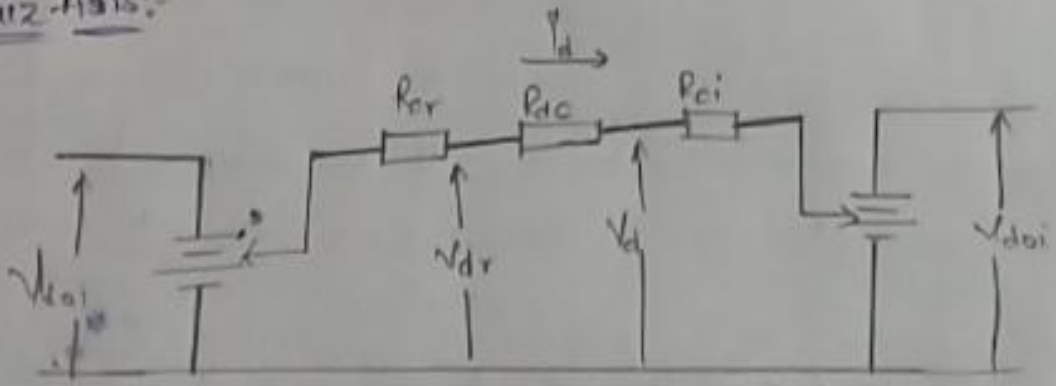
This control scheme uses a phase locked oscillator to generate the firing pulses.

There are 3 variations :-

1) pulse frequency control (PFC)
2) pulse period control (PPC)
3) pulse phase O/P (PPO).

Quiz-Ans:-

1ans



equivalent Circuit of HVDC system.

2ans AC filter are used to reduce ac harmonics of lower order.

3ans $V_{op} = \frac{2V_m}{\pi} \cos\alpha$.

4ans 100-A.

5ans True