

Q = 1(A)

HAN	NAN	WAN
Home Area Network	Neighborhood Area Network	Wide Area Network
→ Grid tie Inverter	Distribution feeder	→ Power plants
→ Zig Bee	DSL	LTE
→ Zigbee is used to communicate the grid tie inverter with home appliances within HAN.	DSL can be used to communicate the distribution feeders within neighbourhood to manage power flow.	LTE based technology can be used within WAN to manage the power plant production and control.

Q = 1(B).

→ DNP3 (Distributed Network Protocol) is set of protocol developed for hardware equipment communication.

→ DNP3 use Master slave topology to communicate for different hardware setup.

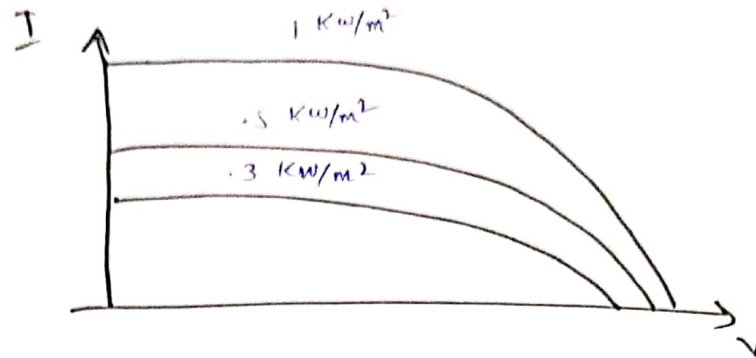
→ In Grid station of communication is happened b/w Relay and CT, PT. Then Relay act as Master and CT, PT act as slave.

→ CT, PT act as slave always send message without Request.

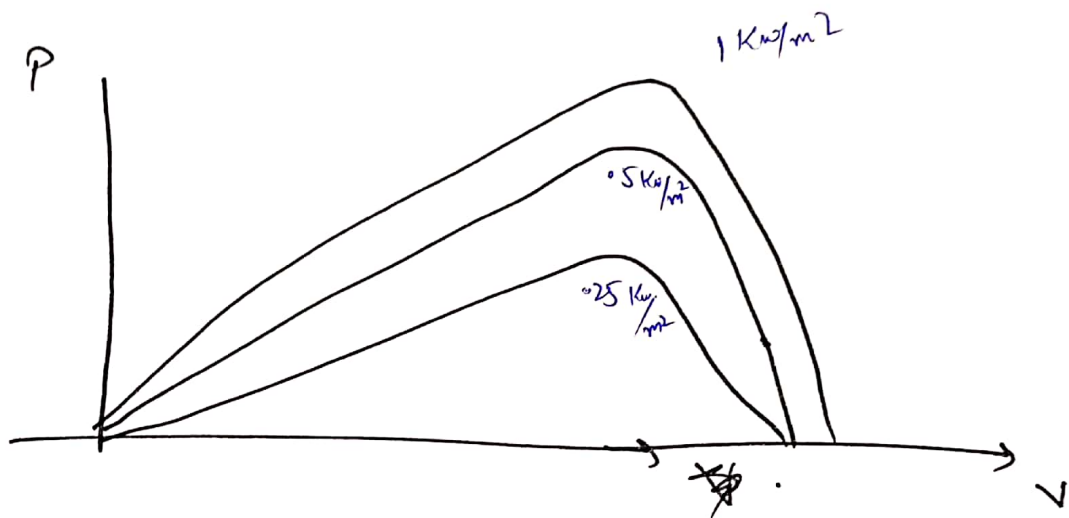
$$Q = 2(A)$$

Varying Irradiance .

V-I Curves .

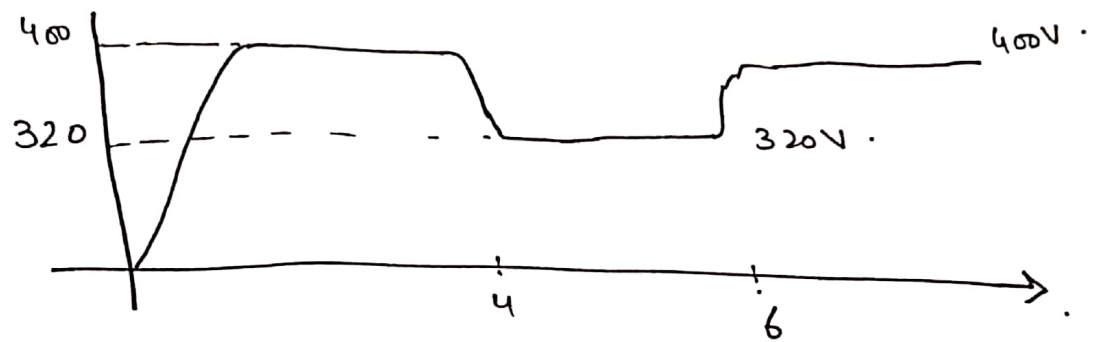
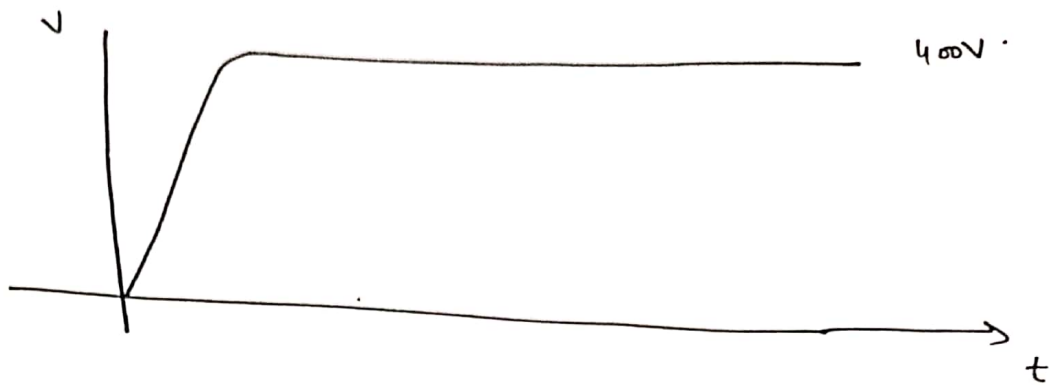


P-V Curves :



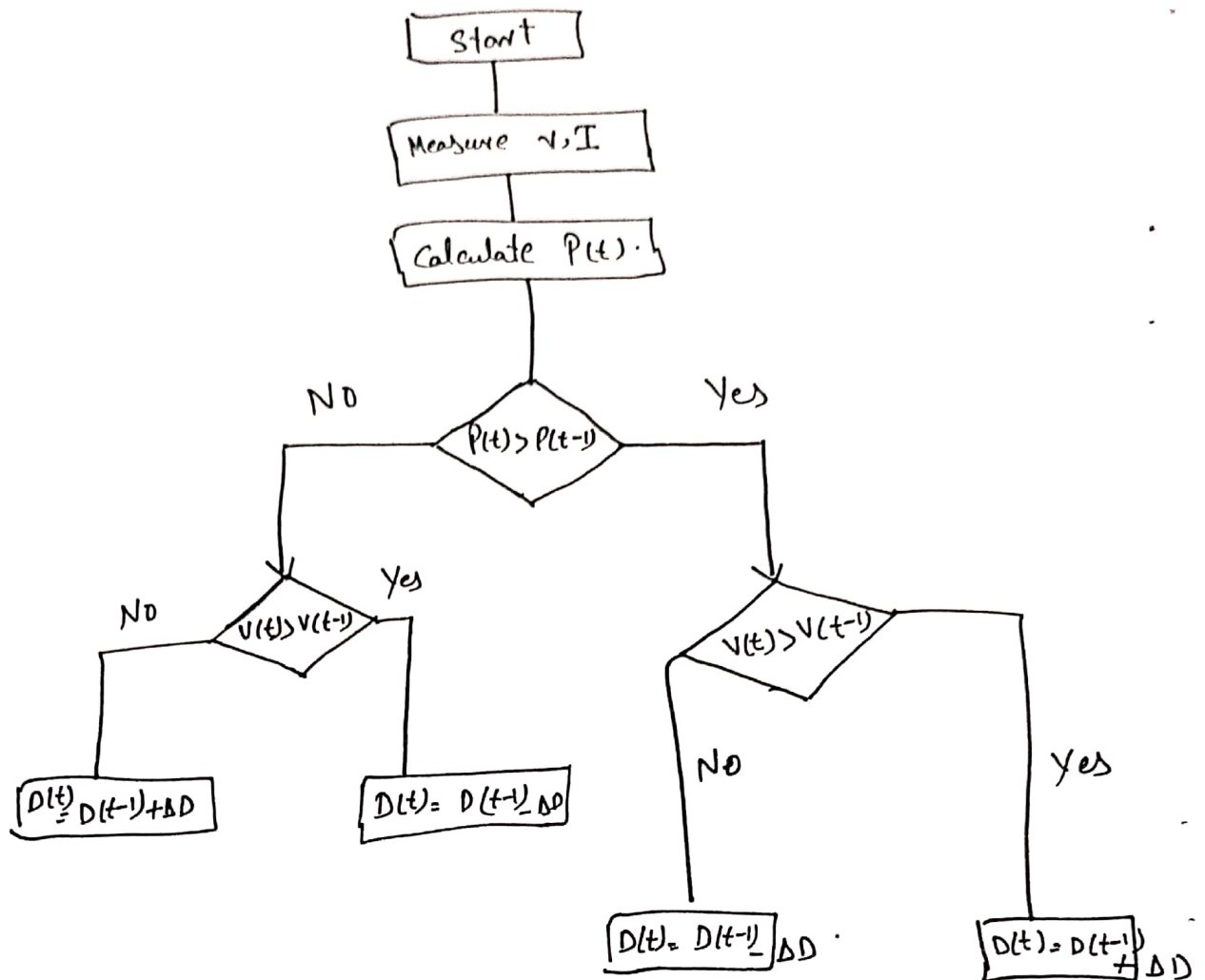
$Q = 2(B)$.

With PI controller.



Q.2(c)

P&O Method



Case 1:

$$\Delta P > 0$$

$$\Delta V < 0$$

$$D - \Delta D$$

Case 2:

$$\Delta P > 0$$

$$\Delta V > 0$$

$$D + \Delta D$$

Case 3

$\Delta P <$

$\Delta V <$

D + DD

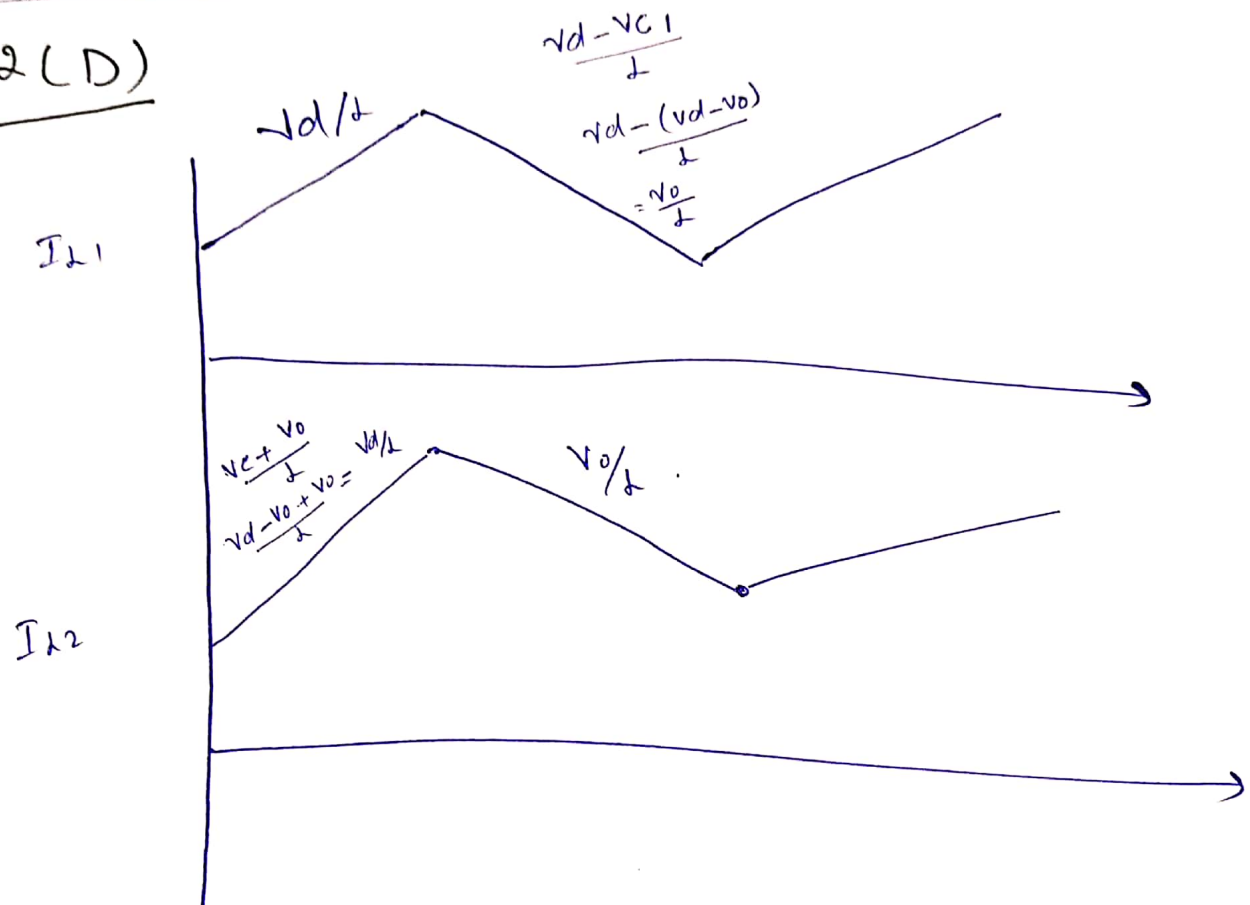
Case 4

$\Delta V >$

$\Delta P <$

D - DD

$d = 2(LD)$



Q.2
(e)

$$V_{abc-dq} = \frac{1}{\sqrt{3}} \begin{bmatrix} 1 & -1/2 & -1/2 \\ 0 & \sqrt{3}/2 & -\sqrt{3}/2 \end{bmatrix} \begin{bmatrix} 150 \\ 50 \\ -150 \end{bmatrix}$$

$$\begin{bmatrix} V_d \\ V_q \end{bmatrix} = \frac{1}{\sqrt{3}} \begin{bmatrix} 150 \\ 173.2 \end{bmatrix} = \begin{bmatrix} 122.47 \\ 141.41 \end{bmatrix}$$

$$V_x = 34995.689$$

$$\boxed{V_x = 187.07}$$

$$U = \frac{187.07}{600} = 0.311$$

$$\theta = \tan^{-1} \left(\frac{141.41}{122.47} \right) = \boxed{49.1^\circ}$$

$$t_a = 0.311 \left(\cos 49.1^\circ - \frac{1}{\sqrt{3}} \sin 49.1^\circ \right) \\ = 0.311 (0.2182) = 0.067$$

$$t_b = \frac{2}{\sqrt{3}} \times 0.311 \times \sin 49.1^\circ$$

$$t_b = 0.27$$

$$\Rightarrow \begin{cases} t_a = 0.067 \times 100 \mu s = 6.7 \mu s \\ t_b = 27 \mu s \\ t_o = 66.3 \mu s \end{cases}$$

