December 2016

31 Saturday
(366 - 000) Wk 53

RES

December
Su Mo Tu We Th Fr Sa
1 2 3
4 5 6 7 8 9 10
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30 31

08:00

09:00 ## Wind Energy :-

10:00 is one of the most available & exploitable form of energy.
11:00 Wind blows from high pressure to low atmospheric pressure. The
12:00 difference in pressure ~~gives wind energy~~ is caused by the fact that earth
13:00 surface is not uniformly heated by sun. Thus wind energy is a by product
14:00 of solar energy available in form of air.

15:00

- Material used in windmill :-

16:00 * Rotor : Glass fiber reinforced plastics & require high strength & fatigue
17:00 resistance 01 Sunday

18:00 * Generator :- Permanent magnets, copper.

19:00 * Tower :- Prestressed concrete Steel.

Eve. * Nacelle :- coolant, brakes, blade pitch change. Steel, aluminunium.

* Gearbox :- epicycle Gears & may get eliminated.

Truth is always strange — stranger than fiction.

December 2016

29 Thursday

(364 - 002) Wk 53

December

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				1	2	3
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08:00

(*) HAWT has 3 types :-

→ multi blade water pumping windmill

→ Dutch type ⇒ grain grinding windmill

→ high speed propeller type windmill.

B) VAWT :-

(*) vertical Axis wind turbine

eg - Savonious rotor, Darrious rotor.

(*) blades attached from top to bottom.

advantages
- (*) generates power independent of wind direc^n.
- (*) low cost
- (*) strong towers not required since generator is on ground.

disadvantages
- (*) efficiency is low (one blade works at a time)
- (*) more turbulent flow near ground.
- (*) may need wires to support

Eve.

Virtue is its own reward.

January

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December 2016

Friday 30

(365 - 001) Wk 53

08:00

Types of Blade :-

Savonious rotor.

Drag Type blade

(*) greater torque

(*) lower rotational speed.

(*) used for mechanical work

(*) $\lambda < 1$

Darrious rotor, HAWT

Lift type blade

(*) lower torque

(*) higher rotational speed

(*) used for power generation

(*) $\lambda > 1$

- Types of windmill / wind turbines / wind generator

A) HAWT : (*) Horizontal Axis wind turbines.

advantages
- (*) In this blades capture wind energy throughout rotation.
- (*) tall towers enabling access to stronger winds

disadvantages
- (*) complexity during construction & need to be turned to face wind
- (*) Strong & huge towers required

Eve.

Unjust rule never endures perpetually.

December 2016

27 Tuesday

(362 - 004) Wk 53

December

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08:00

eg 1:

wind velocity = 15 m/s.

d = 80m 3 blades.

$\lambda = \frac{4\pi}{3}$ $R = \frac{d}{2}$

$= 40m$

$\lambda = \frac{R\omega}{15} = \frac{4\pi}{3}$

$R\omega = 4\pi \times 5$

$R(2\pi N) = 4\pi \times 5$

$N = \frac{20}{2R} = \frac{20}{2 \times 40} = \frac{1}{4}$ rps

$$\boxed{N = \frac{1}{4} \text{ rps}}$$

Eve.

• We are each responsible for our own happiness •

January

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December 2016

Wednesday 28

(363 - 003) Wk 53

08:00

Performance characteristics :-

09:00

A) tip speed ratio :- is the ratio of rotational speed of blade to wind speed. Maximum of 10 for lift type blades.

$\lambda = \frac{V_{tip}}{V_{wind}} \rightarrow R\omega = \left(\frac{4\pi}{n}\right)$ at max^m power

tip speed

n ← no. of blades

11:00

B) Cut in speed :- It is the minimum speed in which the blades will turn. Generally 10 km/h to 16 km/hr.

C) Rated speed :- is the wind speed at which the windmill generates its rated power.

D) Cut-out speed :- It is the speed where windmills are turned off to prevent damage & its usually above 70 km/hr.

Eve.

• Waste not, want not, wilful waste makes woeful want •

December 2016

24 Saturday

(359 - 007) Wk 52

$P_{wind} = \frac{1}{2}\rho A v^3$

$P_{mech} = \frac{1}{2}\rho A v^3 \times C_p$

$P_{elec} = \frac{1}{2}\rho A v^3 \times C_p \times C_F \times N_G \times N_B$

$\rho = \frac{P}{RT}$

08:00

09:00 Power (electrical) $= \frac{1}{2}\rho A V^3 \times C_p \times C_F \times N_G \times N_B$

10:00

11:00 C_p = coefficient of power

V = velocity

ρ = density of wind

$A = \pi r^2$ r = length of blade = swept area

12:00 N_B = gearbox efficiency

13:00 N_G = generator efficiency.

14:00 C_F = capacity factor.

15:00 Power density (wind) $= \frac{P}{A} = \frac{1}{2}\rho V^3$

16:00

17:00 25 Sunday

18:00 $C_p = 4a(1-a^2)^2$

a = interference factor

19:00 rotor speed $\frac{V}{V_{wind}} = 1-a$

$\rho = \frac{P}{RT}$ kg/m³

$R = 287$

T = temp

$P = 1.01325 \times 10^5$

Eve.

• Unwillingness easily finds an excuse •

January

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December 2016

Monday 26

(361 - 005) Wk 53

08:00

09:00 • Stall & Pitch Control:-

By stalling a wind turbine, we increase the angle of attack, which causes the flat side of blade to face further into the wind. Further decreases the angle of attack, causing the edge of blade to face the oncoming wind.

10:00

11:00

12:00

13:00

14:00 • Wind Power eqⁿ:- $\propto (\text{velocity})^3$

15:00 $P_{(wind)} = \frac{1}{2}\rho A V^3$

ρ = density of wind

V = velocity in m/s

A = Area.

16:00

17:00 Swept Area $= \pi r^2$ r = blade length

18:00 Betz value = 0.593

19:00 coefficient of power (C_p) $= \frac{VI}{\frac{1}{2}\rho A V^3}$

Eve. $P = \frac{1}{2}\rho A V_B^3 \times C_p$

P ← turbine power or mechanical power

• Vision without action is a daydream, Action without vision is a nightmare •

December 2016

22 Thursday

(357 - 009) Wk 52

December

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08:00

Note :-

09:00

Fixed Speed Wind turbine

10:00

(*) gives max^m η at only one particular wind velocity

(*) As the rotational speed of CIG's (converter-interfaced generation) is limited by generator slip (2%)

16:00 disadvantages of CIG :- uncontrolled reactive power consumption, mechanical stress, limited power quality control.

Variable Speed wind turbine

(*) gives max^m η at each of wind velocity.

(*) It uses high inertia of rotating mechanical parts of system as flywheel. This helps to reduce power fluctuations & reduce drive train mechanical stress.

19:00

Eve.

• To err is human, to forgive divine •

January

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December 2016

Friday 23

(358 - 008) Wk 52

Speed Control strategies for wind turbine :-

09:00

(*) By stalling the wind turbine, we can increase the angle of attack which makes the flat side of blade face into the wind and if we decrease the angle of attack the edge of blade faces into the wind.

13:00 (*) Pitch control :- The pitch of rotor blades is controlled to regulate the speed.

14:00 (*) Yaw and tilt control :- When rotor axis is shifted out of wind direction either by yaw or tilting the rotor plane with respect to normal vertical plane when wind exceeds design limit.

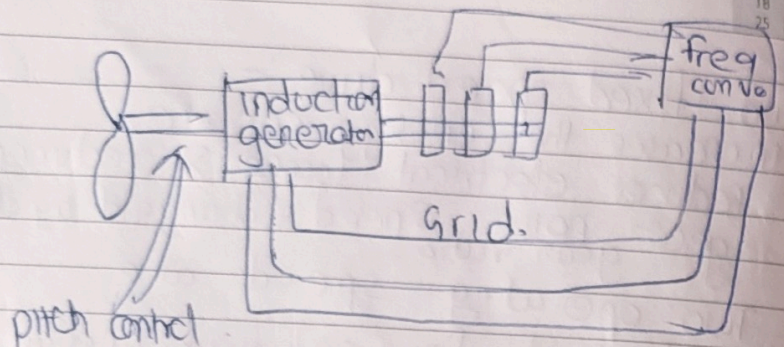
17:00

18:00

19:00

Eve.

• To err is human, to persist in error is devilish •



(B) Fixed Speed drive :-

Under this fixed speed drive, constant speed is maintained at shaft of generator by pitch control. Synchronous or induction generator used to generate electric energy.

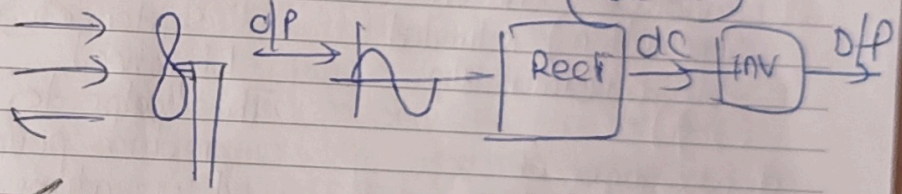
Two types of fixed speed drive :-

(*) one fixed speed drive :-
→ the shaft speed is held fixed for whole range of wind speed.
→ low energy yield
→ major disadvantage is that it never captures wind energy at peak value of Cp as wind energy is wasted when wind speed is > or < optimal value corresponding to Cp max

Note :-

(A) Variable Speed drive using power electronics :-

Variable voltage & variable frequency available from a generator is first rectified to DC then converted to fixed frequency & fixed AC voltage using inverter. The harmonics are filtered out to get grid quality o/p before connecting to grid.



Schebius Variable speed drive :-

(*) This drive makes use of rotor induction motor.

(*) The stator is connected to grid & rotor is connected to variable frequency source using slip ring.

(*) The speed is controlled by controlling the freq of ext voltage injected into rotor

December 2016

17 Saturday

(352 - 014) Wk 51

$C_p = C_T \lambda$

December

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08:00

Note :-

(A) Definitions :-

(1) Angle of attack (α) :-

→ It is the angle b/w central line of blade element & relative wind velocity.

10:00

11:00

12:00

$V_{rel} = V_{wind} - V_{blade}$

13:00

(2) Drag force :- Incremental force (ΔD) on blade element in direction of relative velocity of wind.

14:00

15:00

16:00

(3) Lift force (ΔF_L) :- incremental force acting on blade element in direction ⊥r to relative velocity of wind.

17:00

18 Sunday

18:00

(4) Blade setting angle :- It is the (pitch angle) angle b/w central line of blade element & direction of linear motion of blade element.

19:00

Eve.

• Was it the unbound affection or the entrance to the house that made you slip? •

January

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December 2016

Monday 19

(354 - 012) Wk 52

08:00

(*) Two fixed speed drive :-

09:00

Increases the energy capture reduces electrical losses & reduces gear noise. Speed is changed by changing gear ratio.

10:00

Two operating speeds are selected for optimising energy production

11:00

12:00

Induction generator is designed to operate at two speeds :-

13:00

(i) by having two stator winding with different no. of poles.

14:00

(ii) by using single winding with pole changing arrangement by connecting winding coils in series or parallel.

15:00

16:00

17:00

18:00

19:00

Eve.

• We choose that which we wish continued •

for radius R

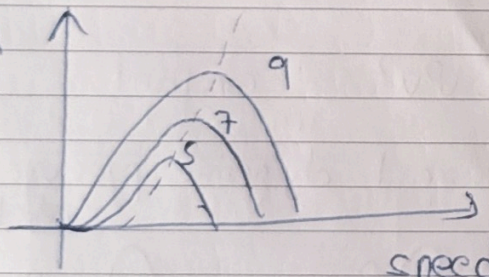
$$P = \frac{1}{2} \rho \pi R^2 V^3$$

If power extracted from wind is maximised if C_p is maximised & $C_{p\,optimum} \rightarrow \lambda_{optimum}$

$$\lambda = \frac{R\omega}{V}$$

$$P_{max} = C_{p\,opt} \frac{1}{2} \rho \pi \left(\frac{R^5}{\lambda^3_{opt}}\right) \omega^3$$

$$P_{max} \propto V^5 (\omega^3)$$



$$T_m = \frac{P_m}{\omega}$$

$$T_m \propto \omega V^2$$

$\downarrow \omega^2$

Similar graph 6 & Pitch

(A) Solidity (Net angle) :-
defined as the ratio of the projected area of rotor blades on the rotor plane to the swept area of rotor

Effect of solidity :-
higher solidity rotors use drag force & hence turn slower & have high torque used for pumping water whereas low solidity rotors use lift force having high speed & low torque used for electrical power generation

(B) Power Speed characteristics :-
It shows how mechanical power that can be extracted from wind depends on rotor speed. For each wind speed there is an optimum turbine speed at which the extracted wind power at shaft reaches its maximum.

$$P_m \text{ (shaft)} = \frac{1}{2} \rho A V^3$$

$$\frac{1}{2}\rho V_1^2 + P_{before} = \frac{1}{2}\rho V^2 + P_{before}$$

$$\frac{1}{2}\rho V^2 + P_{After} = \frac{1}{2}\rho V_2^2 + P_\infty$$

$$\therefore P_{before} - P_{after} = \frac{1}{2}\rho(V_1^2 - V_2^2)$$

$F = PA$

$$\therefore Force = A(P_{before} - P_{after}) = \frac{1}{2}\rho A(V_1^2 - V_2^2)$$

change in momentum $= \rho AV(V_1 - V_2)$

Rate of change in momentum $= \rho AV(V_1 - V_2)$

$= force$

$$= \frac{1}{2}\rho A(V_1^2 - V_2^2)$$

$$\therefore \boxed{V = \frac{V_1 + V_2}{2}} \rightarrow eq^n (1)$$

• Those who do not complain are never pitied •

Note :-

(A) Betz limit :-

It gives us the maximum theoretical efficiency for a wind turbine and its value is 59.3%. which means 59.3% of kinetic energy from wind can be used to spin wind turbine & generate electricity.

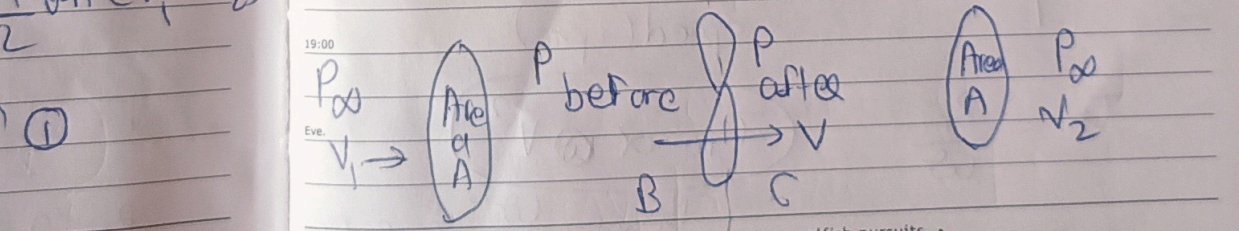
Derive :-

Bernoulli eqn

$$P + \frac{1}{2}\rho v^2 + \rho gh = constant$$

$$P + \frac{1}{2}\rho v^2 = constant$$

Static Pressure + dynamic pressure = constant



• Truth lies beyond our selfish pursuits •

December 2016

10 Saturday

(345 - 021) Wk 50

$C_p = 4a(1-a)$

a = interference factor

$\frac{V_{rotor}}{V_{wind}} = 1-a$

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08:00

$\therefore$ Wind power $P = 2\rho A V_1^3 [a^3 - 2a^2 + a]$

09:00

for max^m power

$\frac{dP}{da} = 0$

10:00

$3a^2 - 4a + 1 = 0$

11:00

$a = 1$ or $\frac{1}{3}$.

12:00

at $a = \frac{1}{3}$ $P = \frac{1}{2}\rho A V_1^3 \left(\frac{16}{27}\right)$

13:00

$\approx 59\%$ of energy in wind

14:00

15:00

$a = 0$ when no load is connected to wind turbine, the blades just freewheel & no reduction in speed at the turbines. The turbine will not generate any power & $C_p = 0$

16:00

11 Sunday

$\therefore$ max value of $C_p = \frac{16}{27}$ (at $a = \frac{1}{3}$)

17:00

$\Rightarrow 0.593$.

18:00

19:00

Eve.

• Whatever you are able to secure from a burning house is a gain •

KE (incoming wind)

$P_0 = \frac{1}{2}mv^2 = \frac{1}{2}\rho V V_1^2 = \frac{1}{2}\rho A L V_1^2$

January

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$P_0 = \frac{\partial(KE)}{\partial t} = \frac{1}{2}\rho A V_1^3$

$\left(\frac{dL}{dt} = V\right)$

December 2016

Monday 12

(347 - 019) Wk 51

08:00

power extracted from wind

09:00

$\frac{P}{P_0} = \frac{\frac{1}{4}\rho A (V_1 + V_2)(V_1^2 - V_2^2)}{\frac{1}{2}\rho A V_1^3}$ ← power in incoming wind

10:00

11:00

$= \frac{1}{2}\left[1 - \left(\frac{V_2}{V_1}\right)^2 + \frac{V_2}{V_1} - \left(\frac{V_2}{V_1}\right)^3\right]$

12:00

13:00

$\frac{V_2}{V_1} = \alpha$

14:00

$\frac{1}{2}\left[1 - \alpha^2 + \alpha - \alpha^3\right]$

15:00

16:00

$\therefore$ Power in wind $= \frac{1}{2}\rho A V (V_1^2 - V_2^2)$

17:00

if $\frac{V_2}{V_1}$ = axial interference factor $(1-a)$ $\Rightarrow$ fractional wind speed decrease at turbine.

18:00

$\boxed{V_2 = V_1(1-2a)}$

19:00

Eve.

$P = \frac{1}{2}\rho A V_1^3 (1-a)[1 - (1-2a)^2]$

$P = 2\rho A V_1^3 [a^3 - 2a^2 + a]$

• To avoid criticism say nothing, do nothing, be nothing •

December 2016

08 Thursday

(343 - 023) Wk 50

RII :- Maxm power tracking :-
rotor speed is varied with wind speed to operate at constant tip speed ratio corresponding to Cp max.

RIII :- Constant power region (Pitch control operation) :-
In high speed winds, the rotor speed is limited to an upper value based on design limits of system. Large machines use pitch control to maintain turbine speed as constant.

RIV :- Out of operation region :-
Beyond max value of wind speed the rotor speed is shut down & power generation gets stopped to protect the blades, generator & other system.

• Winners never quit and quitters never win •

Variation of wind speed with height :-
wind speed → V_z at height z relative to that at reference height = h

$V_z \rightarrow z$

$V_H \rightarrow h$

$V_z = V_H \left(\frac{z}{H}\right)^{\alpha}$

α → low for good sites

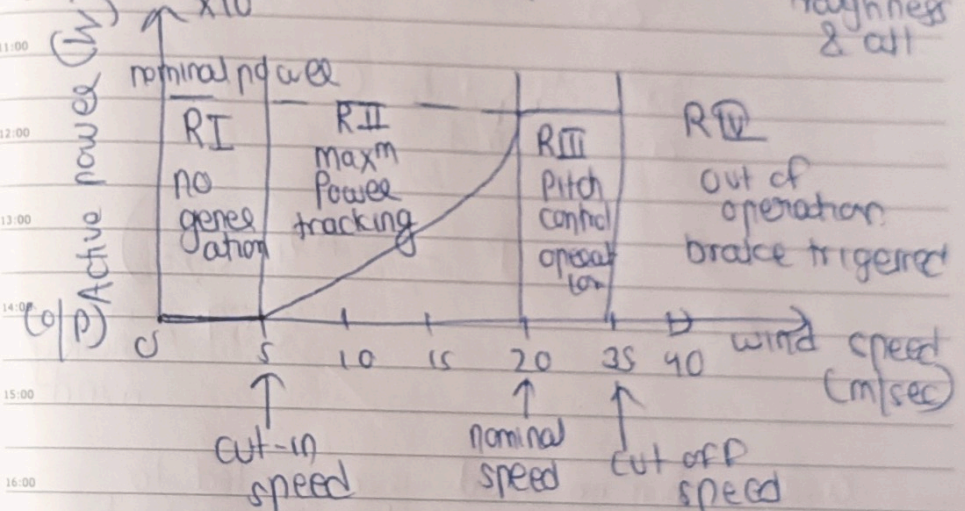
α → depends on surface roughness & alt

December 2016

Friday 09

(344 - 022) Wk 50

(a) Power vs wind speed :-



RI :- low speed region
the wind turbine is kept in braked posn till 5 m/s wind speed is available which is cut in speed. Operation of wind turbine below this speed is not efficient.

• Will a wild cat observe the fast of Sivaratri ? •

December 2016

06 Tuesday

(341 - 025) Wk 50

December

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08:00

- Solar constant :- (I_{sc})

It is defined as energy recieved from the sun, per unit time, on a unit area of surface perpendicular to direction of propagation of radiation at top of atmosphere & at earth's mean distance from sun.

$I_{sc} = 1367\ W/m^2$

- Extra-terrestrial radiation deviates from solar constant due to :-

(*) variation in radiation emitted by sun itself.

(*) variation of earth & sun distance arising from earth's slightly elliptical path.

- Peak Watt / Watt peak :- Wp

It is used for power produced by photovoltaic cell at a radiation level of $1000 W/m^2$ wind speed 1m/s & cell temp $25^\circ C$.

Eve.

- To climb steep hills requires slow pace at first -

January

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December 2016

Wednesday 07

(342 - 024) Wk 50

Mod - II

09:00

(T1) Note :-

- Irradiance :- defined as the measure of power density recieved at location on earth in W/m^2 → W/m^2

- Irradiation :- is defined as the measure of energy density of sunlight and is measured in kWh/m^2 → kWh/m^2

- Extra-terestial radiation :-

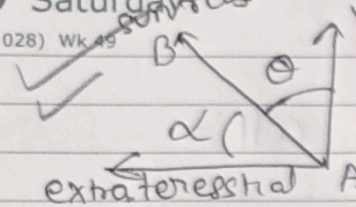
Solar radiation on outer atmosphere of earth is known as extra terrestial radiation. as being outside the atmosphere not affected by changes in atmospheric condition.

- Terrestrial radiation :-

Solar radiation that reaches the earth surface after passing through earth atmosphere is terrestrial radiation while passing through earth's atmosphere it is subjected to scattering and mechanism of atmospheric absorption so its intensity decreases

Eve.

- When poverty come in the door, love goes out the window -



$AM = \sec\theta = \frac{AB}{AC}$

or $\operatorname{cosec}(\alpha)$

$\theta + \alpha = 90$

eg :- $V_{oc} = 0.6\,V$ $I_{sc} = 30\,mA/cm^2 \times 10^{-4}$

~~$1\,cm^2$ 30mA~~

$I_C = 1000\,W/m^2$

I_T

$FF = 76\%$

$$\eta = \frac{FF \times (V_{oc} I_{sc})}{1000 \times 10^{-4}}$$

$1\,cm \rightarrow 10^{-2}\,m$

$1\,cm^2 \rightarrow 10^{-4}\,m^2$

04 Sunday

0.6V

$FF = 76\% = 0.76$

Area not given so $1\,cm^2$

$I_{sc} = 30\,mA/cm^2$

$\eta = ?$

$I_T = 1000\,W/m^2$

$$0.76 = \frac{P_{max}}{0.6 \times 30 \times 10^{-3} \times 10^{-4}}$$

$P_{max} =$

• Things do not change; we change •

$1m \rightarrow 100\,cm$

$1cm \rightarrow 10^{-2}\,m$

$1\,cm^2 \rightarrow 10^{-4}\,m^2$

T2

Performance Characteristics :-

• Fill factor :- (FF)

It is defined as the ratio of peak power to product of OC voltage, SC current.

It indicates quality of cell. & $FF < 1$

$$FF = \frac{P_{max}}{V_{oc} I_{sc}} = \frac{V_{max} I_{max}}{V_{oc} I_{sc}}$$

• max conversion efficiency (η) :-

In a p'solar cell ratio of max useful power to incident solar radiation is η

$W/m^2 \times m^2 = W$

$$\eta = \frac{P_{max}}{I_T \times A_c}$$

I_T = Incident of solar flux W/m^2

A_c = area of cell

• Air mass :-

It is defined as ratio of path ~~through atmosphere~~ length travelled by beam radiation to vertical path length of atmosphere

$AM = \sec\theta_z$

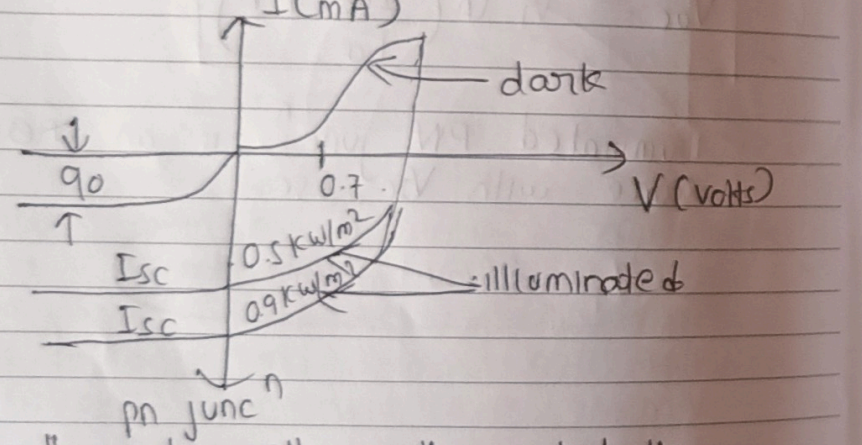
• Thinking is the talking of the soul with itself •

Solar cell characteristics :-

characteristics of ordinary silicon pn junction has dark characteristics with pn junction not illuminated.

$$I = I_o \left\{ \exp\left\{ \frac{V}{V_T} \right) - 1 \right\}$$

I_o = reverse saturation current
V_T = voltage equivalent of temp $= \frac{KT}{q}$
K = boltzman const $= 1.3807 \times 10^{-23}$ J/K
q : charge of $e^- = 1.6 \times 10^{-9}$ C

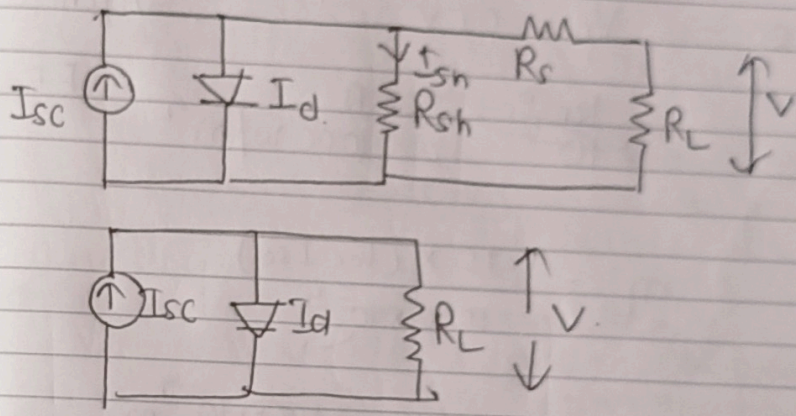


As the solar cell is illuminated the characteristics are modified as the photon generating component is added to reverse leakage current.

• Where boasting ends, there dignity begins •

Equivalent CKt of PV cell :-

PV cell → current source only

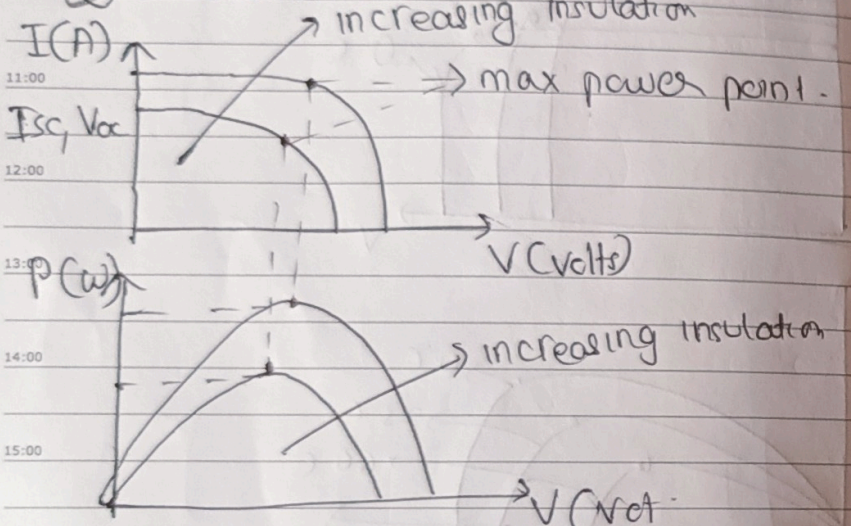


The equivalent ckt consists of a current source supply Isc current. Internal shunt resistance Rsh & series Resistance Rs. Id is current through diode.
Usually the shunt resistance is much greater than ext load resistance so most of current flows through load and as Rs is small so less energy is dissipated.

• To enjoy life one should give up the lure of life •

- Effect of variation of insulation and temp :-

Insulation :-



both shortcircuit current & the open circuit voltage increase with increase in intensity of radiation.
The photon generated current depends directly on insulation. So the short circuit current denends linearly while the open circuit voltage depends logarithmically on insulation.

$$I = I_o\left\{exp\left(\frac{V}{V_T} - 1\right)\right\} - I_{sc}$$

$I = -I_{sc}$ flows through the external path emerging from p side & I_{sc} magnitude depends on solar insulation. and when a voltage source is inserted in external path with +ve polarity on p-side by increasing magnitude of external voltage from 0, the current starts decreasing.

$$V_{oc} = V_T \ln\left(\frac{I_{sc}}{I_o} + 1\right)$$

Illuminated PN junc^n is an energy source with V_{oc}, I_{sc}.

$V_T = 26mV$ at room temp

• Why should he give a measure of pepper and drink the pepper broth in secret ? •

• Wisdom has the advantage of giving success •

November 2016

26 Saturday

(331 - 035) Wk 48

November

Su	Mo	Tu	We	Th	Fr	Sa
•	•	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	•	•	•

08:00

Note :-

09:00 (A) Maximum Power Point tracking :-

When a solar PV is used in a system its operating point is decided by load connected in system.

10:00 Operating point varies throughout the day as solar radiation falling on PV module vary throughout the day.

11:00 In order to ensure operation of PV module for max power transfer a special method called MPPT is employed in system where electronic circuitary is used to

12:00 ensure max amount of generated power transfer to load

13:00

14:00

15:00

16:00

The mechanism is based on principle of impedance matching b/w load & PV module. & the impedance matching is done by dc - dc converter by changing duty cycle of switch

17:00 27 Sunday

18:00

19:00

Eve.

• To accept good advice is but to increase one's ability •

December

Su	Mo	Tu	We	Th	Fr	Sa
•	•	•	•	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

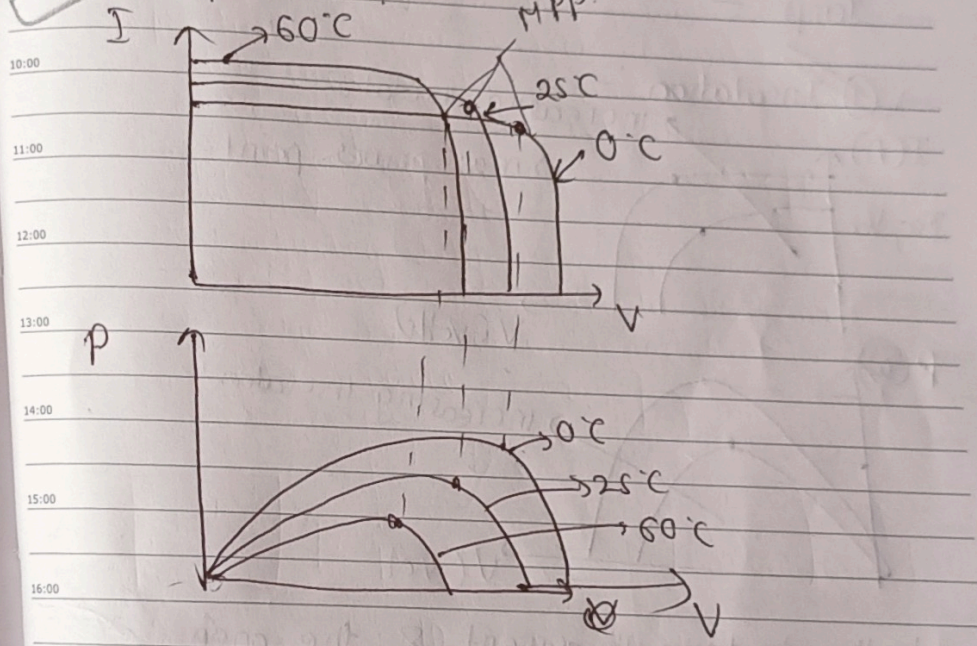
November 2016

Monday 28

(333 - 033) Wk 49

08:00

09:00 (2) Temperature :-



10:00

11:00

12:00

13:00

14:00

15:00

16:00

17:00 When temp is increased there is a marginal increase in I_{cell} current but significant decrease in cell voltage because increase in temperature causes band gap to decrease thus causing a increase in photogeneration rate and a marginal increase in current. but reverse saturation current increases with temp resulting in decrease in cell voltage

18:00

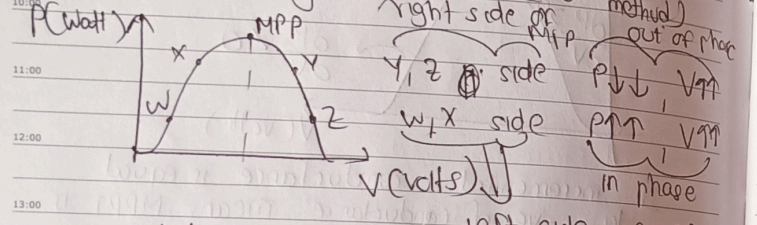
19:00

Eve.

• We live in our desires rather than in achievements •

MPPT algorithms :-

(a) Hill climbing method (P & O method)



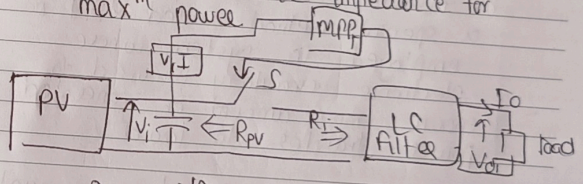
- real time tracking & one of the simplest method.
- By making a small perturbation in duty ratio a new operating point is obtained.

(b) Constant voltage method :-
uses the fact that ratio of array voltage corresponding to MPP and open circuit voltage is constant.

$\frac{V_{mpp}}{V_{oc}} \approx 0.78$ independant of external condn

The power from solar module is calculated by measuring V & I. This power is the i/p to algorithm which adjusts the duty cycle of the switch resulting in adjustment of reflected load impedance according to power o/p of PV module.

By adjusting duty cycle R_i can be varied which should be same as solar PV module impedance for max^m power



R_i = i/p side reflected resistance

$$R_i = \frac{R_L}{d^2}$$

d = duty cycle

November 2016

22 Tuesday

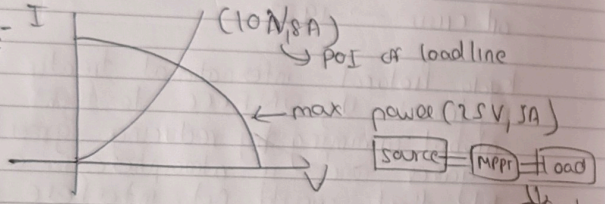
(327 - 039) Wk 48

Buck $R_{in} = \frac{R_L}{d^2}$ = DC-DC converter

Boost $R_{in} = R_L(1-d^2)$

Buck boost $R_{in} = R_L\left(\frac{1-d}{d}\right)^2$

eg:- I



source — MPPT — load

- additional power gain if MPPT is interfaced b/w source & load.

MPPT => 24000 how long should it run to recover the cost

η = 95% Electricity = 3/kwh

load line : 10V x 8A = 80W

Max Power = 25 x 5 = 125W

o/p of MPPT = 95% of 125W = 0.95 * 125 = 118.75W

∴ Gain in power after MPPT = 118.75 - 80 = 38.75W = 0.3875 KW.

find load line power MPPT power subtract to add final supply power

Eve.

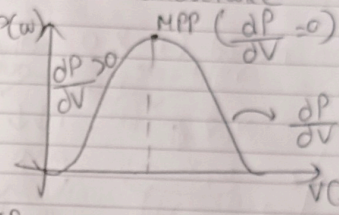
• Wit is the salt of conversation, not the food •

November 2016

Wednesday 23

(328 - 038) Wk 48

① Incremental conductance



If incremental conductance is equal to -ve of conductance means MPPT is obtained

$$\frac{\Delta I}{\Delta V} = \frac{-I}{V}$$

$\Delta I = I(n) - I(n-1)$

$\Delta V = V(n) - V(n-1)$

Note:-

very useful application of dc-dc converter comes from the fact that variation in duty cycle can not only used to regulate o/p voltage but also i/p side impedance of converter which helps in MPPT algorithms of PV arrays

• There is no gambling like politics •

November 2016

19 Saturday

(324 - 042) Wk 47

mppt → power = 25 x 5 = 125W

load line power = 10 x 8 = 80W

η_{mppt} = 95%

$P_{output\ (mppt)} = 0.95 * 125$
$= 118.75\ W$

∴ extra power = 118.75 - 80
= 38.75 W

energy = 38.75 * t W/hr.

cost = $3 * \frac{38.75}{1000} * t = 4000$

20 Sunday

$t = \frac{4000}{0.03875 * 3}$

= 34408.602 hrs.

24 hrs → 1 day

34408.602 hrs → $\frac{1 \times 34408.602}{24}$ = 1433 days

• You are judged by the company you keep •

November 2016

Monday 21

(326 - 040) Wk 48

1 kwh → 3

t kwh → 3 * t.

energy = 3 * t * 0.03875 = 24000

t = ?

Oil crisis → 1973

Kyoto Protocol : international treaty implemented by UNFCCC to fight global warming by reducing greenhouse gases once in atmosphere to a lvl that would not interfere with atmosphere

• Worrying never did anyone any good •

November 2016

17 Thursday

(322 - 044) Wk 47

November

Su	Mo	Tu	We	Th	Fr	Sa
•	•	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	•	•	•

08:00

① $\rho = \frac{P}{RT}$

09:00

$= \frac{1.01325 \times 10^5}{287 \times 300}$

10:00

$= 1.17$

11:00

$r = 40m$ wind 20m/s

12:00

motor speed = 40rpm

13:00

$\tau_{sh} = \frac{P}{\omega}$

14:00

$P_{max} = \frac{1}{2} \rho A v^3$

15:00

λ = tip speed ratio at max o/p

16:00

$= \frac{4\pi}{n}$ n = no of blades = 1 (here)

17:00

blade

$\lambda = \frac{R\omega}{20}$ ← wind $= 4\pi$

18:00

$R\omega = 4\pi \times 20$

19:00

Eve.

• There is no instinct like that of the heart •

December

Su	Mo	Tu	We	Th	Fr	Sa
•	•	•	•	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

November 2016

Friday 18

(323 - 043) Wk 47

08:00

$\omega = \frac{80\pi}{40} = 2\pi$ rad/sec

09:00

$\omega = \frac{2\pi N}{60}$

10:00

$N = \frac{60 \times \omega}{2\pi} = 60$ rps

11:00

12:00

$P_{wind} = \frac{1}{2} \rho \times 1.17 \times \pi \times (40)^2 \times 20^3$

13:00

$= 7488\pi$ KW

14:00

$\eta = \frac{P_{wind\ (max)}}{}$

15:00

16:00

17:00

18:00

19:00

Eve.

• Wise-men never sit and wait their loss •