Question 2.1

PIN Diode

```
.include rn142s.txt
.include Diode_1N914.txt

vdc 1 0 dc 0v

R1b 1 b2 100
D1 b2 b3 DRN142S
vdc_b b3 b4 dc 0v
R2b b4 0 100


*DC analysis to sweep vds from 0 to 5V
.dc vdc 0.01 5 0.01


.control
set color0 = rgb:f/f/e
set color1 = rgb:/1/1/1
run
plot vdc_b#branch vs v(b2,b3)
plot ln(vdc_b#branch) vs v(b2,b3)

.endc
.end
```

PIn Diode

FV = 600 mV, PIV = 60 V, ideality = 1.47 R_Sat = 0.136 nA

Question 2.2

rev_recovery

```
.include rn142s.txt
.include Diode_1N914.txt

v_in 1 0 pulse( 10 -10 0 0 0 0.05us 0.1us)

R1b 1 b2 100
D1 b2 b3 DRN142S
vdc_b b3 b4 dc 0v
R2b b4 0 1k


.tran 0.1ns 0.3us

.measure tran rev_rec
+ TRIG vdc_b#branch VAL=-8m FALL=2 TARG vdc_b#branch VAL=-8m RISE=2

.control
set color0 = rgb:f/f/e
set color1 = rgb:/1/1/1
run
plot vdc_b#branch

.endc
```

.end

- **In script change the transient time according to frequency**

Frequency	Rev_Rec PIN	Rev_Rec PN
10KHz	2.132448e-07	2.871917e-09
100KHz	2.132444e-07	2.871917e-09
1Mhz	1.690884e-07	2.871917e-09
10MHz	5.001994e-08	2.871763e-09

good rectifier-1n914
potential of passing input signal to output – rn142s

Question 2.3

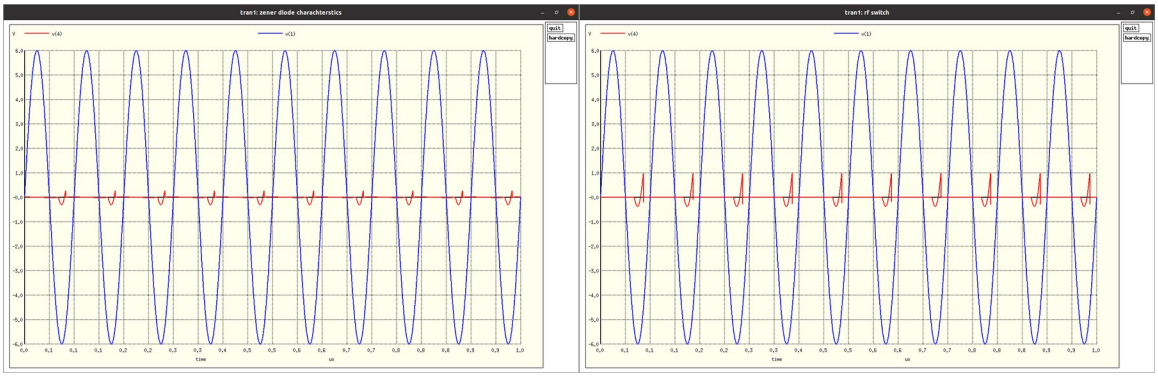
rf switch

```
.include rn142s.txt
.include Diode_1N914.txt

vdc_bias 5 0 dc 2v
vin 1 0 sin (0 6v 10Meg 0 0)

C1 1 2 100n
D1 3b 2 1N914
v_test 3b 3 dc 0v
R1 2 0 500
R2 3 5 500
C2 3 4 100n
v_test1 4b 4 dc 0v
R3 4b 0 50

.tran 0.1ns 1us
.control
set color0 = rgb:f/f/e
set color1 = rgb:/1/1/1
run
plot V(4)  V(1)
plot v_test1#branch
meas tran I1_peak PP v_test#branch from=1us to=1us
meas tran I1_max max v_test#branch from=1us to=1us
print I1_max - I1_peak/2

.endc
.end
```

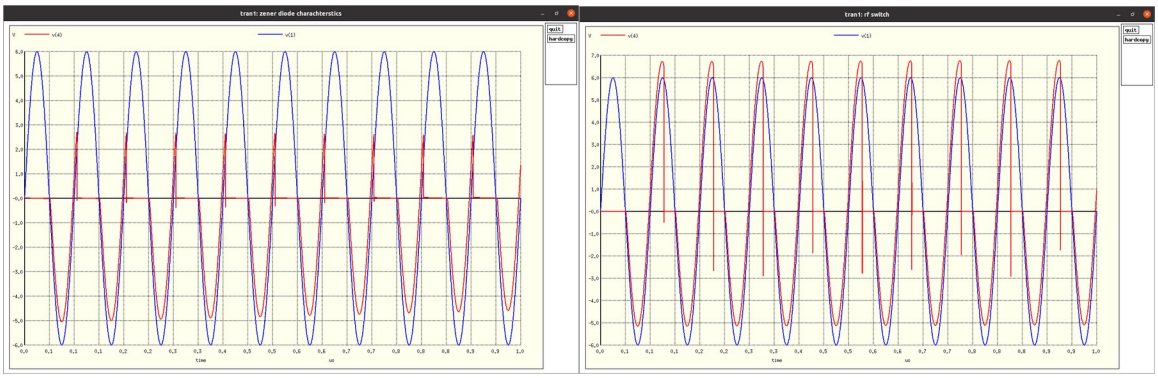
Dc bias calculated with given polarity
PN Diode/PIN Diode

PN diode PIN diode

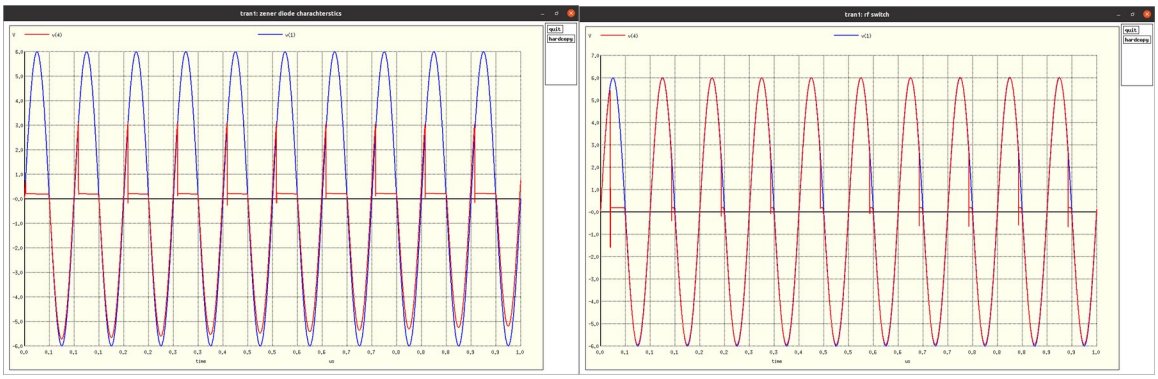
@ -5v (DC bias current of pin diode ⇒1.148611e-04)



@ 0v (DC bias current of pin diode ⇒2.063043e-02)



@ 5 V (DC bias current of pin diode ⇒1.55785e-03)



->@+5V switch – ON position

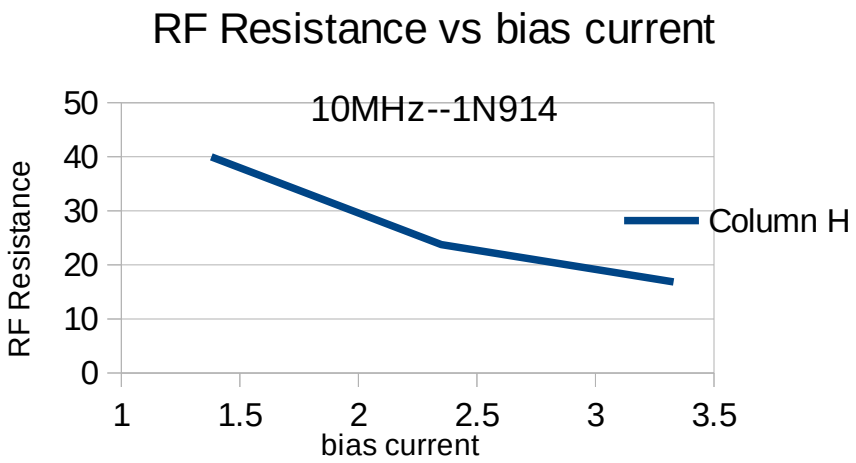
->@ -5V switch – OFF position(very less power to output)

-> DC bias current is the dc componet of the current. Small dc bias current can allow larger swing at the output current.

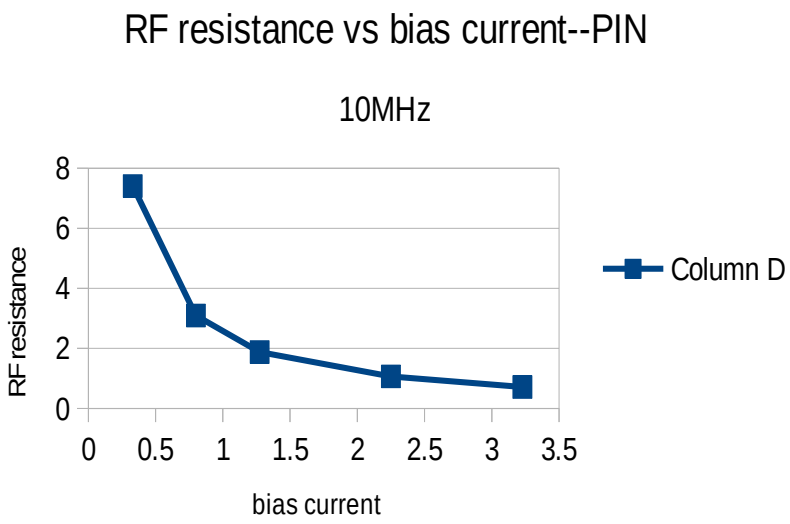
->Compare right side waveforms(PIN) and left side waveforms(PN) given above, we can see PIN can work as a switch by varying bias current whereas PN can't.

Question 2.4

```
PIN_PN Resistance
.include rn142s.txt

Vin 1 0 sin (10 1 1Meg 0 0)

D1 3 0 DRN142S
v_test 2 3 dc 0v
r1 1 2 1k

.tran 0.1ns 5us


.control
set color0 = rgb:f/f/e
set color1 = rgb:/1/1/1
run
plot v(3)
plot v_test#branch
meas tran v1_peak PP v(3) from=1us to=5us
meas tran I1_peak PP v_test#branch from=1us to=5us
meas tran I1_max max v_test#branch from=1us to=5us
print I1_max - I1_peak/2
print v1_peak/I1_peak

.endc
.end
```



<here only three points taken to give approximate graph, but they are expected to hav bias current from 0.5m to 3mA, atleast>



-> bias current is inversly related to RF current.

-> Resistance is very small for PIN @ 10MHz compared to that of PN. Look at the graphs