```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%% Power Electronics ECE 412 Homework #2
%%%%%% Writer: Hyeongmeen Baik
%%%%%% Email: hyeongmeen.baik@wisc.edu
%%%%%% Link: github.com/PhilBaik/WISC_2023Fall/blob/master/ECE412_PE
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

clc;
clear;

VF= 1
```

VF = 1

```
Vin = 100
```

Vin = 100

```
D = 0.75
```

D = 0.7500

```
Vc = D*Vin - (1-D)*VF
```

Vc = 74.7500

```
Io = 10
```

Io = 10

```
tcr = 20e-9;
tvf = 30e-9;
tvr = 35e-9;
tcf = 15e-9;

Woff = 1/2*(Vin+VF)*Io*(tcf+tvr)
```

Woff = 2.5250e-05

```
Won = 1/2*(Vin+VF)*Io*(tcr+tvf)
```

Won = 2.5250e-05

```
Rds_on = 0.18
```

Rds_on = 0.1800

```
Is = D*Io
```

Is = 7.5000

```
Is_RMS = sqrt(D)*Io
```

```
Is_RMS = 8.6603
```

```
is_peak = Io
```

```
is_peak = 10
```

```
Ps_cond = Rds_on*D*Io^2
```

```
Ps_cond = 13.5000
```

```
Id = Io−D*Io
```

```
Id = 2.5000
```

```
Id_RMS = sqrt(1−D)*Io
```

```
Id_RMS = 5
```

```
id_peak = Io
```

```
id_peak = 10
```

```
Pd_cond = VF*Io*(1−D)
```

```
Pd_cond = 2.5000
```

```
%% Q3
fs_low = 1e3;
fs_high = 500e3;

Ps_swit1 = fs_low*(Woff+Won)
```

```
Ps_swit1 = 0.0505
```

```
Ps_swit2 = fs_high*(Woff+Won)
```

```
Ps_swit2 = 25.2500
```

```
Ps_tot1 = Ps_swit1 + Ps_cond
```

```
Ps_tot1 = 13.5505
```

```
Ps_tot2 = Ps_swit2 + Ps_cond
```

```
Ps_tot2 = 38.7500
```

```
RthJA = 40;
RthJC = 0.83;
RthCS = 0.24;
Rthcase = 4;
RthJA_heat_sink = RthJC+RthCS+Rthcase;
```

```
Tdiff1 = RthJA*Ps_tot1
```

Tdiff1 = 542.0200

```
Tdiff2 = RthJA*Ps_tot2
```

Tdiff2 = 1550

```
Tdiff1_case = RthJA_heat_sink*Ps_tot1
```

Tdiff1_case = 68.7010

```
Tdiff2_case = RthJA_heat_sink*Ps_tot2
```

Tdiff2_case = 196.4625

```
P_tot1 = Ps_tot1 + Pd_cond
```

P_tot1 = 16.0505

```
P_tot2 = Ps_tot2 + Pd_cond
```

P_tot2 = 41.2500

```
Pin = Vin*Is
```

Pin = 750

```
Po1 = Pin−P_tot1
```

Po1 = 733.9495

```
Po2 = Pin−P_tot2
```

Po2 = 708.7500

```
n1 = Po1/Pin
```

n1 = 0.9786

```
n2 = Po2/Pin
```

n2 = 0.9450

```
Vo1 = Po1/Io
```

Vo1 = 73.3950

```
Vo2 = Po2/Io
```

Vo2 = 70.8750

```
%% q5
temp_diff_max = 125
```

temp_diff_max = 125

```
Ps_max = temp_diff_max/RthJA_heat_sink
```

Ps_max = 24.6548

```
Ps_switch_max = Ps_max − Ps_cond
```

Ps_switch_max = 11.1548

```
fs_max = Ps_switch_max/(Woff+Won)
```

fs_max = 2.2089e+05