```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%% Hyeongmeen Baik
%%%% ECE412 Power Electronics
%%%% HW 3
```

Q3

```
clc;
clear;
Vo_min = 5
```

```
Vo_min = 5
```

```
Vo_max = 20
```

```
Vo_max = 20
```

```
IESR = 10
```

```
IESR = 10
```

```
RESR = 0.05
```

```
RESR = 0.0500
```

```
Vin = 12
```

```
Vin = 12
```

```
%%%% Vo_min case
D1 = (IESR*RESR+Vo_min)/(Vo_min+Vin)
```

```
D1 = 0.3235
```

```
Io1 = IESR-D1*IESR
```

```
Io1 = 6.7647
```

```
Iin1 = D1*IESR
```

```
Iin1 = 3.2353
```

```
Pin1 = Vin*Iin1
```

```
Pin1 = 38.8235
```

```
Po1 = Io1*Vo_min
```

```
Po1 = 33.8235
```

```
Rload1 = Vo_min/Io1
```

```
Rload1 = 0.7391
```

```
n1 = Po1/Pin1*100
```

```
n1 = 87.1212
```

```
%%%% Vo_max case
D2 = (IESR*RESR+Vo_max)/(Vo_max+Vin)
```

```
D2 = 0.6406
```

```
Io2 = IESR-D2*IESR
```

```
Io2 = 3.5938
```

```
Iin2 = D2*IESR
```

```
Iin2 = 6.4063
```

```
Pin2 = Vin*Iin2
```

```
Pin2 = 76.8750
```

```
Po2 = Io2*Vo_max
```

```
Po2 = 71.8750
```

```
Rload2 = Vo_max/Io2
```

```
Rload2 = 5.5652
```

```
n2 = Po2/Pin2*100
```

```
n2 = 93.4959
```

```
PESR = IESR^2*RESR
```

```
PESR = 5
```

```
```

Q4

```
%%%% Vo_min case
Vs1 = (1-D1)*(Vin+Vo_min)
```

```
Vs1 = 11.5000
```

```
VsRMS1 = sqrt(1-D1)*(Vin+Vo_min)
```

```
VsRMS1 = 13.9821
```

```
VsPeak1 = Vin+Vo_min
```

```
VsPeak1 = 17
```

```
Vd1 = D1*(Vo_min+Vin)
```

```
Vd1 = 5.5000
```

```
VdRMS1 = sqrt(D1)*(Vo_min+Vin)
```

```
VdRMS1 = 9.6695
```

```
Vdpeak1 = Vo_min+Vin
```

```
Vdpeak1 = 17
```

```
%%%% Vo_max case
Vs2 = (1-D2)*(Vin+Vo_max)
```

```
Vs2 = 11.5000
```

```
VsRMS2 = sqrt(1-D2)*(Vin+Vo_max)
```

```
VsRMS2 = 19.1833
```

```
VsPeak2 = Vin+Vo_max
```

```
VsPeak2 = 32
```

```
Vd2 = D2*(Vo_max+Vin)
```

```
Vd2 = 20.5000
```

```
VdRMS2 = sqrt(D2)*(Vo_max+Vin)
```

```
VdRMS2 = 25.6125
```

```
Vdpeak2 = Vo_max+Vin
```

```
Vdpeak2 = 32
```

Q5

```
clc;
clear;
Vin = 12;
Vo = 20;
D_boost = (Vo-Vin)/Vo
```

```
D_boost = 0.4000
```

```
D_buckboost = Vo/(Vin+Vo)
```

```
D_buckboost = 0.6250
```

```

```

```
deliL = 100e-3
```

```
deliL = 0.1000
```

```
fs = 50e3
```

```
fs = 50000
```

```
Ts = 1/fs
```

```
Ts = 2.0000e-05
```

```

L_boost = Vin*D_boost*Ts/deliL
```

```
L_boost = 9.6000e-04
```

```
L_buckboost = Vin*D_buckboost*Ts/deliL
```

```
L_buckboost = 0.0015
```

```

%%%% ideal case
Vsbuckboost = (1-D_buckboost)*(Vin+Vo)
```

```
Vsbuckboost = 12
```

```
VsbuckboostRMS = sqrt(1-D_buckboost)*(Vin+Vo)
```

```
VsbuckboostRMS = 19.5959
```

```
VsbuckboostPeak = (Vin+Vo)
```

```
VsbuckboostPeak = 32
```

```
Vdbuckboost = D_buckboost*(Vo+Vin)
```

```
Vdbuckboost = 20
```

```
VdbuckboostRMS = sqrt(D_buckboost)*(Vo+Vin)
```

```
VdbuckboostRMS = 25.2982
```

```
VdbuckboostPeak = Vo+Vin
```

```
VdbuckboostPeak = 32
```

```

%%%% ideal case
Vsboost = (1-D_boost)*(Vo)
```

```
Vsboost = 12
```

```
VsboostRMS = sqrt(1-D_boost)*(Vo)
```

```
VsboostRMS = 15.4919
```

```
VsboostPeak = (Vo)
```

```
VsboostPeak = 20
```

```
Vdboost = D_buckboost*(Vo-Vin)
```

```
Vdboost = 5
```

```
VdboostRMS = sqrt(D_buckboost)*(Vo-Vin)
```

```
VdboostRMS = 6.3246
```

```
VdboostPeak = Vo-Vin
```

```
VdboostPeak = 8
```

```
%%%% Considering ESR for boost converter

Vin = 12
Vo= 20
RESR = 0.05

syms Iin
eqn=Vin-Iin*RESR == Vo/Iin*20/5.5652
S=solve(eqn)
Iin = double(S(1,1))
D = 1-3.5938/Iin
```