EXPERIMENT

1. OBJECTIVES:
   a. Write a Matlab program to plot motor efficiency curve, whose parameters are mentioned below:
      Kc=0.2;
      Ki=0.08;
      Kw=0.00001;
      Constant losses = 400 Watt;
      Motor Speed =1 to 1000 rad/sec (50 samples)
      Torque =1 to 250 Nm (50 samples)
   b. Plot a 3D plot between torque, speed and efficiency.
   c. Plot a contour map between torque, speed and efficiency, where efficiency (0.6,0.7,0.8,0.9).
   d. Plot a contour map between torque, speed and efficiency, where input power (5000 and 7000) Watts.
2. SOFTWARE REQUIRED
   a. MATLAB R2021a
   b. Windows 10
3. PROCEDURE
   a. Open MATLAB
      Open new M-file
   b. Type the program
   c. Save in current directory
   d. Compile and Run the program
   e. For the output see command window\ Figure window
4. PROGRAM

```
% EXPERIMENT-5
% (a)Write a Matlab program to plot motor efficiency curve
N = linspace(1,1000,50); %Speed
T = linspace(1,250,50); %Torque
Kc = 0.2;
Ki = 0.08;
Kw = 0.00001;
ConstLoss = 400; %Constant Loss
[X,Y] = meshgrid(N,T);
Out_power = X.*Y; %Output power
Cu_loss = (Y.^2)*Kc; %Copper loss
Fe_loss = (N*Ki); %Iron loss
Wind_loss = ((X.^3).*Kw); %Windage loss
Inp_power = Out_power + Cu_loss+ Fe_loss+ Wind_loss +
ConstLoss; %Input power
```

```
E = Out_power./Inp_power; %Efficiency
%(b) Plot a 3D plot between torque, speed and efficiency.
figure(1);
plot3(X,Y,E);
xlabel("Motor Speed rad/sec");
ylabel("Torque N-m");
zlabel("Efficiency");
title("Plot between Motor speed, Torque and Efficiency");;
%(c) Plot a contour map between torque, speed and efficiency,
where efficiency (0.6,0.7,0.8,0.9).
D = [0.6, 0.7, 0.8, 0.9];
grid off;
figure(2);
contour(X,Y,E,D);
xlabel("Motor Speed rad/sec");
ylabel("Torque N-m");
title("Efficiency contour");
%(d) Plot a contour map between torque, speed and efficiency,
where input power (5000 and 7000) Watts.
figure(3);
contour(X,Y,E,D);
xlabel("Motor Speed rad/sec");
ylabel("Torque N-m");
title("Efficiency contour");
hold on;
F = [5000, 7000];
contour(X,Y,Inp_power,F);
```

5. OUTPUT

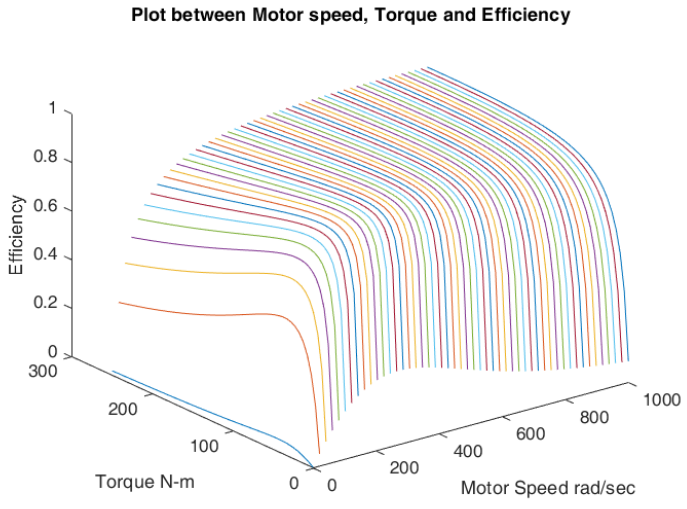

Figure 1: Plot between Speed, Torque and Efficiency

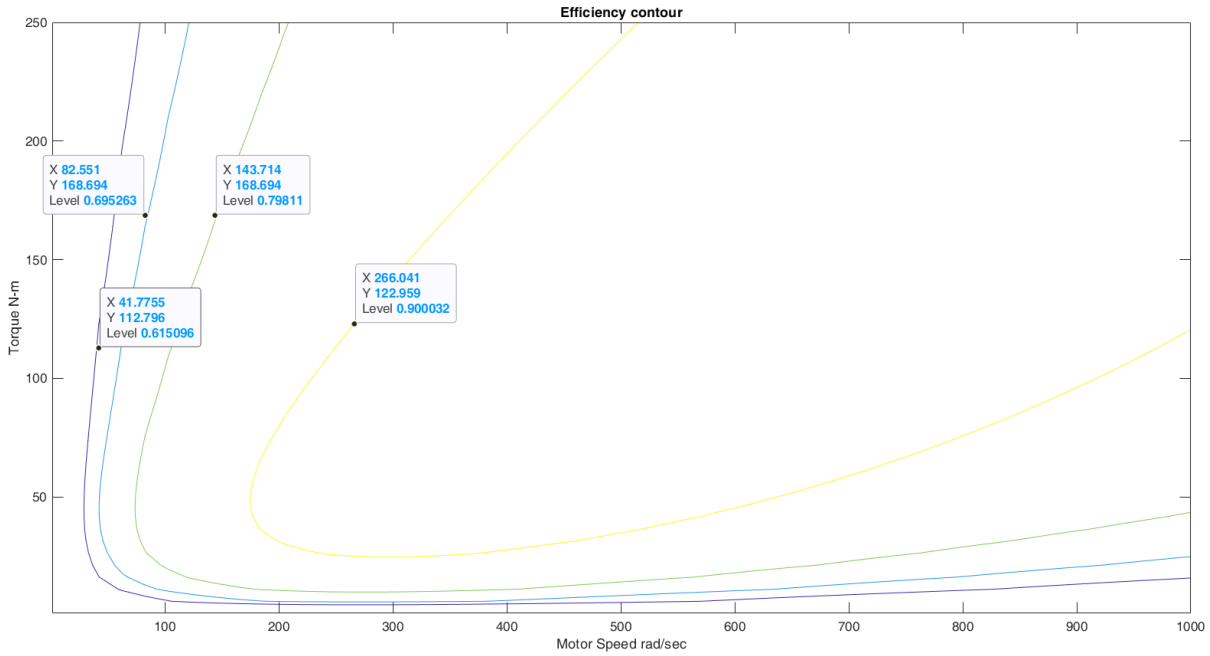

Figure 2: Contour plot for efficiences 60%, 70%, 80% and 90%

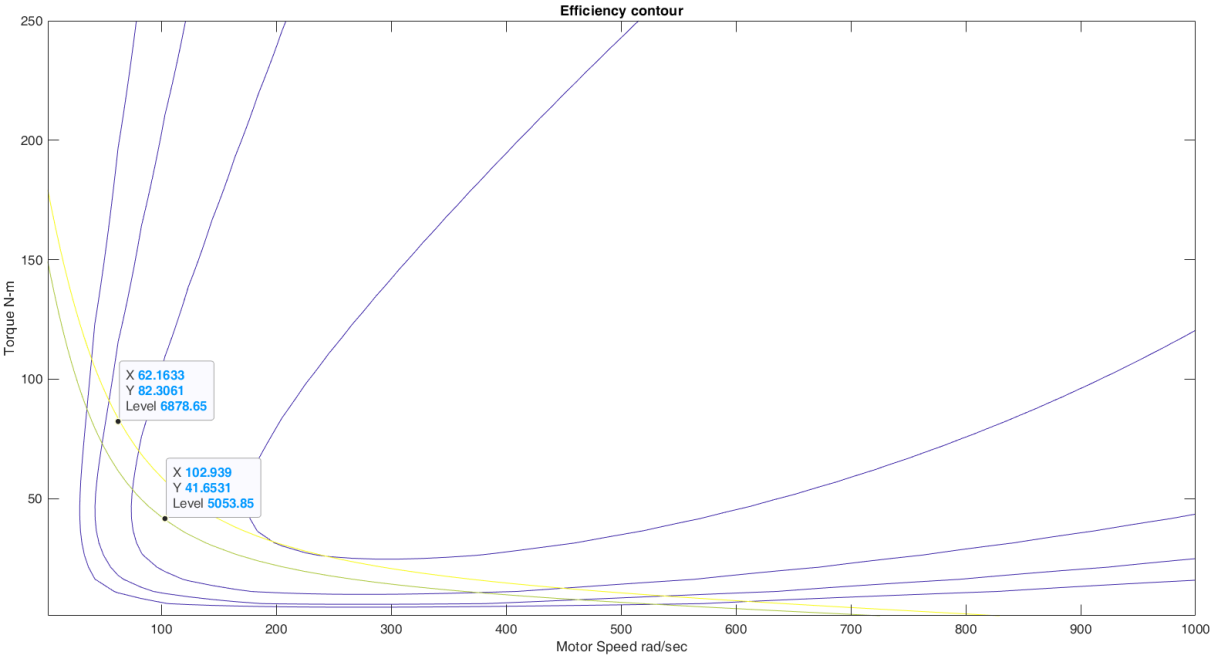

Figure 3: Contour plot for input power 5000W and 7000W