Lab:10

Implementing Exponential Distribution in MATLAB

Code:

```
% Commonly a car cooling system are controlled by electrically fan.
% Assuming that life time "T"(in hours) of a fan manufactured by a company
% A,B,C can be modeled an expoenential distribution lambda=0.0003. Find the
% probability of fan which will give at least 10,000 hours service.

% Define the lambda value
lambda = 0.0003;

hours = 10000;

% Calculate the probability of fan which will give at least min_service_hours
prob = exp(-lambda*hours);

fprintf('The probability of a fan giving at least %d hours of service is: %.4f\n', hours, prob);

% Array of lambda
lambda_array = [0.0001, 0.0002, 0.0003, 0.0004, 0.0005];

% Define an array of service hour values
service_hours = 0:1:10000;
% Plot the probability of service hours for different values of lambda
figure;
hold on;
for i = 1:length(lambda_array)
    lambda_i = lambda_array(i);
    prob_i = exp(-lambda_i*service_hours);
    plot(service_hours, prob_i, 'DisplayName', sprintf('\\lambda = %.4f', lambda_i));
end
xlabel('Service Hours');
ylabel('Probability');
title('Probability of Fan Service Hours for Different \\lambda Values');
legend('show');
hold off;

% Calculate and display the variance of the exponential distribution
variance = 1/lambda^2;
fprintf('The variance of the exponential distribution with \\lambda = %.4f is: %.4f\n', lambda,
variance);
%PDF
pdf = lambda*exp(-lambda*hours);
fprintf('The PDF of the exponential distribution with \\lambda = %.4f is: %.4f\n', lambda, pdf);

%CDF
cdf = 1 - exp(-lambda*hours);
fprintf('The CDF of the exponential distribution with \\lambda = %.4f is: %.4f\n', lambda, cdf);
```

Fig_10.1(Illustrating the MATLAB code)

Output:

```
The probability of a fan giving at least 10000 hours of service is: 0.0498
The variance of the exponential distribution with \lambda = 0.0003 is: 11111111.1111
The PDF of the exponential distribution with \lambda = 0.0003 is: 0.0000
The CDF of the exponential distribution with \lambda = 0.0003 is: 0.9502
```

Fig_10.2(Illustrating the MATLAB output)

Workspace:

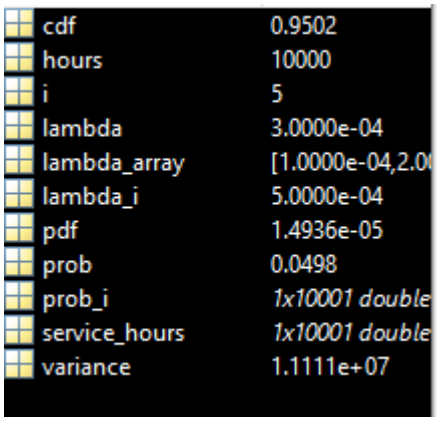

Fig_10.3(Illustrating the MATLAB output's workspace)

Graph:

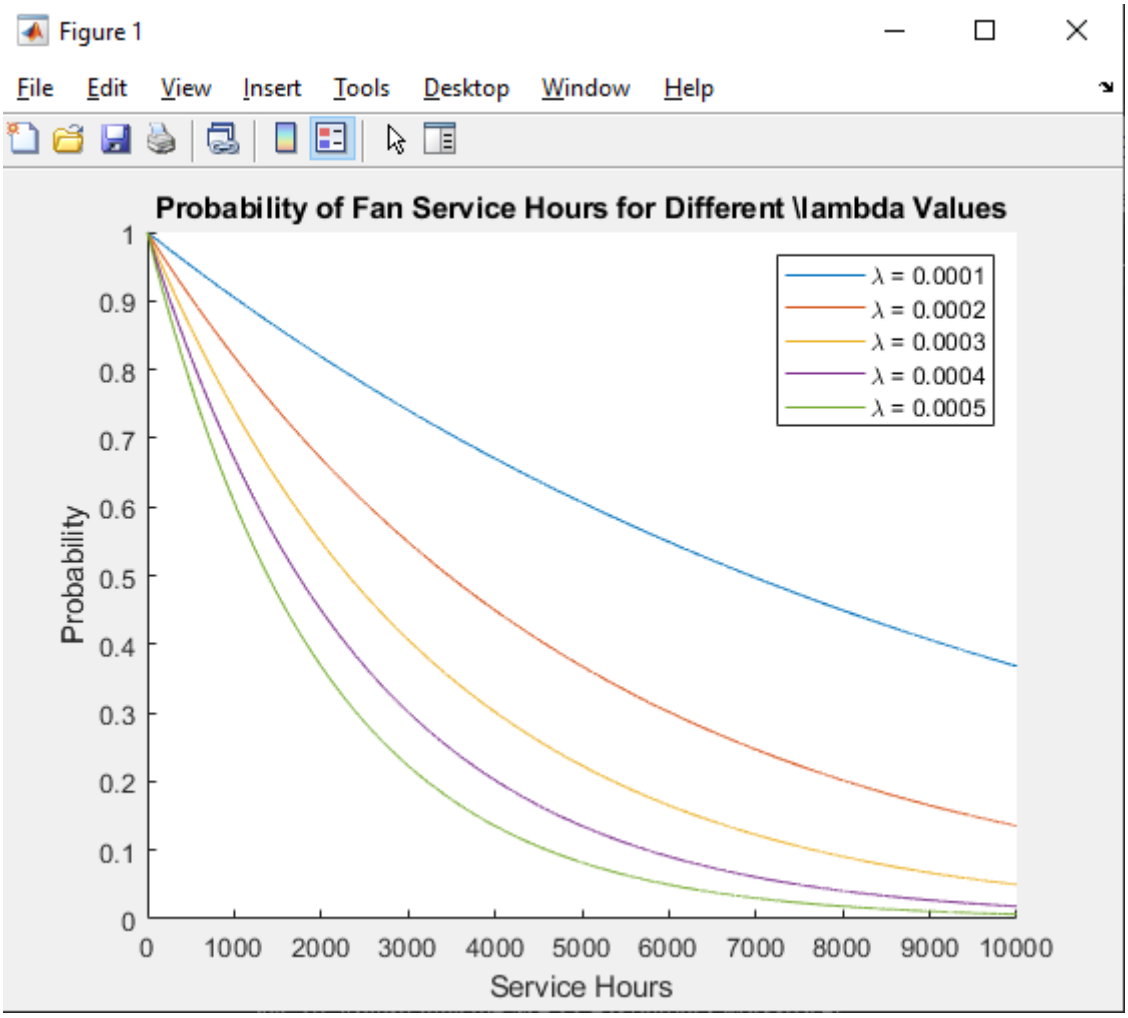

Fig_10.3(Illustrating the MATLAB output's graph for different lambda)

Conclusion:

After implementing exponential distribution in MATLAB we verified the results for the following problem statement and plotted graphs for different value of lamda and also found PDF and CDF of given problem Statement.

Problem Statement:

```
% Commonly a car cooling system are controlled by electrically fan.
% Assuming that life time "T"(in hours) of a fan manufactured by a company
% A,B,C can be modeled an expoenential distribution lambda=0.0003. Find the
% probability of fan which will give at least 10,000 hours service.
```

Fig_10.4(Illustrating the Problem statement)