Q1 Write a MATLAB script with two functions.

- The first function (call it `circle`) inputs the radius r and angle θ ($circle(r, \theta)$), and outputs the (x, y) coordinates of all the points located at the circle with radius r centered at origin $(0, 0)$.

$$\text{function [x, y] = circle(r,theta)}$$

- The second function (call it `rdcircle`) inputs the (x, y) coordinates of all the points located at the circle and outputs m points p_j for $j = 1, 2, ..., m$, by choosing p_1 as a random point that can be generated using **rand-1 + 1i*(rand-1)**, and generating other points by

$$p_{j+1} = 0.5p_j + 0.5(z_k - p_j) \tag{1}$$

where $k \in \{1, 2, ..., n\}$ is randomly chosen for each j (n is the number of coordinates that you generated for (x, y)) and $z = e^{x+y*i}$ (note that z is a vector and z_k is one element).

$$\text{function p = rdcircle(x,y)}$$

- The main script (see below) draws two figures. The first one is just a circle with $r = 2$ centered at origin (filled with some color). The second one shows $m = 10000$ points produced by `rdcircle` for $r = 5$ as dots.

```
%% main script file
% Part 1
theta = 0:0.001:2*pi; % or use linspace
[x,y]  = circle(2,theta);
% plotting
subplot(1,2,1)
fill(x,y,'y')
axis equal off

% Part 2
r      = 5;
m      = 10000;
[x,y] = circle(r,theta);
p      = rdcircle(x,y,m);
% plotting
subplot(1,2,2)
plot(real(p),imag(p),'b.','MarkerSize',1)
axis equal off


% function 1: generate points on a circle
function [x,y] = circle(r,theta)
      % main body (you need to fill in the details)
end
```

```
% function 2: generate m points based on (x,y) on a circle
function p = rdcircle(x,y,m)
    % main body (you need to fill in the details)
end
```

Hints:

1. you can use **randi** to generate k. Check the function `fill` in MATLAB.

2. the second plot uses the real and imaginatary part of p to plot, i.e., plot(real(p),imag(p),'b.','MarkerSize',1), where p is the vector that stores all the points generated by (1).