**Lab 7**

**Speech and Image Processing**

Group assignment up to 3 students per group.

Using MATLAB or Octave, perform the following tasks

**Part (a)** 2 marks

Save the following MATLAB code in a file called distribution1.m and indent it properly. Then run it.

for i=1:1000 r1=rand(); t1=rand()\*2\*pi; x(i)=3+r1\*cos(t1); y(i)=2+r1\*sin(t1)/4; end; plot(x',y','.')

Write in a few sentences what is happening in the above code. Save the graph in the form of an image (jpg or png) file.

**Part (b)** 2 marks

Write code to calculate mean vector and covariance matrix for the above distribution of 2-dimensional vectors

**Part (c)** 2 marks

Is this distribution normal distribution? Justify your answer.

**Part (d)** 2 marks

Modify the code so that it generates an approximately normal distribution. Use rand() function only and not any other high-level normal distribution random number generator.

Hint: Look up central limit theorem

**Part (e)** 2 marks

The covariance matrix for Part (a) would have large values on the diagonal and very small values off diagonal, since the distribution is axis aligned. Write code to create a distribution that is not axis aligned and hence has significant values in off-diagonal entries of the covariance matrix. Calculate mean vector and covariance matrix for these 2-dimensional vectors.

**Deliverables:**

* MATLAB code
* Text answers for Part (a) and (c)
* Graphs saved as images