

## Q1:

```
function Q1(n)
    imgTrainAll=loadMNISTImages('train-images.idx3-ubyte');
    lblTrainAll=loadMNISTLabels('train-labels.idx1-ubyte');

    img=imgTrainAll(:,n);
    img=reshape(img,28,28);
    imgLabel=num2str(lblTrainAll(n));
    figure;
    imshow(img);
    title(imgLabel);
end
```

## Q2:

```
function Q2(n)
    imgTestAll=loadMNISTImages('t10k-images.idx3-ubyte');
    lblTestAll=loadMNISTLabels('t10k-labels.idx1-ubyte');

    img=imgTestAll(:,n);
    img=reshape(img,28,28);
    imgLabel=num2str(lblTestAll(n));
    figure;
    imshow(img);
    title(imgLabel);
end
```

## Q3:

```
function Q3()
    lblTrainAll=loadMNISTLabels('train-labels.idx1-ubyte');
    m=zeros(10,2);
    for i=1:10
        m(i,1)=i-1;
    end
    for i=1:size(lblTrainAll,1)
        k=lblTrainAll(i);
        m(k+1,2)=m(k+1,2)+1;
        i=i+1;
    end
    disp(table(m));
    writetable(table(m),'Q3.csv','Delimiter',' ','QuoteStrings',true);
end
```

## Q4:

```
function Q4()
    lblTestAll=loadMNISTLabels('t10k-labels.idx1-ubyte');
    m=zeros(10,2);
```

```

for i=1:10
    m(i,1)=i-1;
end
for i=1:size(lblTestAll,1)
    k=lblTestAll(i);
    m(k+1,2)=m(k+1,2)+1;
    i=i+1;
end
disp(table(m));
writetable(table(m), 'Q4.csv', 'Delimiter', ',', 'QuoteStrings', true);
end

```

## Q5:

```

function Q5(n)
    if(n<0 || n>10000)
        disp('Tham so khong hop le');
        return;
    end
    imgTrainAll=loadMNISTImages('train-images.idx3-ubyte');
    lblTrainAll=loadMNISTLabels('train-labels.idx1-ubyte');

    mdl=fitcknn(imgTrainAll', lblTrainAll);

    imgTestAll=loadMNISTImages('t10k-images.idx3-ubyte');
    lblTestAll=loadMNISTLabels('t10k-labels.idx1-ubyte');

    imgTest=imgTestAll(:,n);
    lblImgTest=num2str(lblTestAll(n));

    lblPredict=predict(mdl, imgTest');

    figure;
    img2D=reshape(imgTest, 28, 28);
    imshow(img2D);

    message=['Anh test: ', lblImgTest, '.'];
    message=[message, 'Du doan : '];
    message=[message, num2str(lblPredict)];

    if(num2str(lblPredict)==lblImgTest)
        message=[message, '. => Ket qua dung'];
    else
        message=[message, '. => Ket qua sai'];
    end
    title(message);
end

```

## Q6:

```

function Q6(n)

```

```

if(n<0||n>10000)
    disp('Tham so khong hop le');
    return;
end
imgTrainAll=loadMNISTImages('train-images.idx3-ubyte');
lblTrainAll=loadMNISTLabels('train-labels.idx1-ubyte');

mdl=fitcknn(imgTrainAll',lblTrainAll);

imgTestAll=loadMNISTImages('t10k-images.idx3-ubyte');
lblTestAll=loadMNISTLabels('t10k-labels.idx1-ubyte');

imgTest=imgTestAll(:,n);
lblImgTest=num2str(lblTestAll(n));

lblPredict=predict(mdl,imgTest');

figure;
img2D=reshape(imgTest,28,28);
imshow(img2D);

message=['Anh test: ',lblImgTest, '.'];
message=[message, 'Du doan : '];
message=[message, num2str(lblPredict)];

if(num2str(lblPredict)==lblImgTest)
    message=[message, '. => Ket qua dung'];
else
    message=[message, '. => Ket qua sai'];
end
title(message);
end

```

## Q7:

```

function Q7(n)
m=zeros(length(n),2);
imgTrainAll=loadMNISTImages('train-images.idx3-ubyte');
lblTrainAll=loadMNISTLabels('train-labels.idx1-ubyte');

mdl=fitcknn(imgTrainAll',lblTrainAll);

imgTestAll=loadMNISTImages('t10k-images.idx3-ubyte');
lblTestAll=loadMNISTLabels('t10k-labels.idx1-ubyte');

for i=1:length(n)
    m(i,1)=n(i);
    for j=1:size(lblTestAll,1)
        k=lblTestAll(j);
        if(k==n(i))
            imgTest=imgTestAll(:,j);
            lblPredict=predict(mdl,imgTest');
            if(num2str(lblPredict)~=num2str(k))

```

```
        m(i,2)=m(i,2)+1;
    end
    end
    j=j+1;
end
i=i+1;
end
disp(m);
writetable(table(m),'Q7.csv','Delimiter',' ','QuoteStrings',true);
end
```