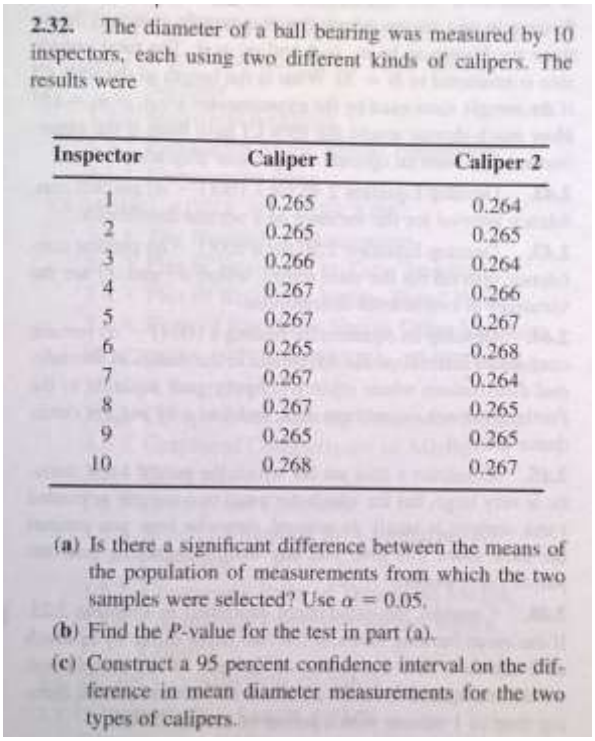
DAE8th Problem 2.32

GIVEN:



2.32. The diameter of a ball bearing was measured by 10 inspectors, each using two different kinds of calipers. The results were

Inspector	Caliper 1	Caliper 2
1	0.265	0.264
2	0.265	0.265
3	0.266	0.264
4	0.267	0.266
5	0.267	0.267
6	0.265	0.268
7	0.267	0.264
8	0.267	0.265
9	0.265	0.265
10	0.268	0.267

(a) Is there a significant difference between the means of the population of measurements from which the two samples were selected? Use $\alpha = 0.05$.

(b) Find the *P*-value for the test in part (a).

(c) Construct a 95 percent confidence interval on the difference in mean diameter measurements for the two types of calipers.

SOLUTION:

A) in MATLAB code

```
x1=0.26+1e-3*[4,5,4,6,7,8,4,5,5,7]';
x2=0.26+1e-3*[5,5,6,7,7,5,7,7,5,8]';
X=[x1,x2];
n=size(X,1);

% A) H0: μ0=μ1 vs H1: μ0~=μ1
% unknown variance, assumed equal
% double sided test
m1=mean(x1);
m2=mean(x2);
alfa=0.05;
dF=(n+n-2);
S1=sqrt(sum((x1-m1).^2)/(n-1));
S2=sqrt(sum((x2-m2).^2)/(n-1));
Sp=sqrt(((n-1)*S1^2+(n-1)*S2^2)/(n+n-2));
stdErr=Sp*sqrt(n^-1+n^-1);
t0=(m1-m2)/stdErr
tR=tinv(1-alfa/2,dF)
rejectH0=abs(t0)>=abs(tR)

t0 =-1.2104
tR = 2.1009
rejectH0 = 0
```

B) In MATLAB code

```
pVal= 2*(1-tcdf(abs(t0),dF))

pVal = 0.2418
```

C) In MATLAB code

```
tRci=tinv(1-alfa/2,dF)*stdErr;
%tRci = 0.0012
deltaM=m1-m2
ciUp=deltaM+tRci
% ciUp = 5.1499e-04
ciLo=deltaM-tRci
% ciLo = -0.0019
```

Note that the test will be different if the variances are different.