**Question 1**

proc iml;

x = {1 2.21, 1 1.49, 1 2.81, 1 0.79, 1 1.02,1 2.93,1 1.21};

y = {6.9, 14.9, 3.3, 11.2, 11.3, 4.0, 9.9};

/\*q-a\*/

xpx = x`\*x;

xpy = x`\*y;

xpxinv = inv(xpx);

b = xpxinv\*xpy;

print b;

/\*q-b\*/

h = x\*xpxinv\*x`;

yhat = h\*y;

n = nrow(x);

p = ncol(x);

ssr = y`\*(h-(1/n)\*J(n,n,1))\*y;

sse = y`\*(I(n) - h)\*y;

ssto = y`\*(I(n)-(1/n)\*J(n,n,1))\*y;

ssr = y`\*(h-(1/n)\*J(n,n,1))\*y;

mse = sse/(n-p);

msr = ssr/1;

df = n-p;

f = msr/mse;

pval = 1 - probf(f,1,df);

print ssr sse ssto msr mse f pval;

/\*q-c\*/

b =xpxinv\*xpy;

print b;

var\_b = mse\*xpxinv;

print var\_b;

/\*q-d\*/

se\_b = sqrt(mse \* h[1,1]);

lower = b[1,1] - tinv(0.975,n-p) \* se\_b;

upper = b[1,1] + tinv(0.975,n-p) \* se\_b;

print lower upper;

/\*q-e\*/

e = Y[3] - yhat[3];

print e;

/\*q-f\*/

var\_e = mse\*(I(n)-H);

se\_e = sqrt(var\_e[3,3]);

print se\_e;

/\*q-g\*/

ans\_g = mse\*h[1,2];

print ans\_g;

**Question 2**

%let SEED = 68414;

data scov(type=cov);

input \_TYPE\_ $ 1-4 \_NAME\_ $ 6-15 sat\_score age los num\_nurse num\_visits;

cards;

COV sat\_score 161.3 -56.6 -14.1 21.3 27.5

COV age -56.6 154.3 20.7 4.7 11.3

COV los -14.1 20.7 49 1.3 5.6

COV num\_nurse 21.3 4.7 1.3 25 3.7

COV num\_visits 27.5 11.3 5.6 3.7 9

MEAN 61.9 39.7 19.4 20.4 10.6

;

run;

proc simnorm data=scov outsim=ssim numreal=47 seed=&SEED;

var sat\_score age los num\_nurse num\_visits;

run;

data satisfaction;

set ssim;

sat\_score = round(sat\_score);

age = round(age);

los = round(los);

num\_nurse=round(num\_nurse);

num\_visits=round(num\_visits,0.1);

drop Rnum;

run;

proc print data=satisfaction;

run;

proc corr data=satisfaction csscp;

var sat\_score age;

run;

proc corr data = satisfaction FISHER(RHOO = 0 ALPHA = 0.05);

VAR sat\_score age los num\_nurse num\_visits;

run;

proc reg data = satisfaction;

MODEL sat\_score = age / CLB;

OUTPUT OUT = outdata P=p\_noint;

QUIT;

DATA extra\_obs;

INPUT age los num\_nurse num\_visits;

CARDS;

50 3 10 10

;

RUN;

DATA satisfaction\_extra;

SET satisfaction extra\_obs;

RUN;

PROC REG DATA= satisfaction\_extra;

MODEL sat\_score = age /CLI ;

output out=outputstats2 p=yhat stdi=se\_predict stdp=se\_mean residual=e;

RUN;QUIT;

proc print data=outputstats2;

var sat\_score age yhat e se\_mean se\_predict;

run;

**Question 3**

proc iml;

a = {3 -1 7, 2 5 1, 1 11 9};

b = {1, 4, 2};

c = {0 1 1, 1 1 0};

d = {1 0, 1 0, -1 3};

ans = (c\*d);

ans\_a = a + ans;

print ans\_a;

ans\_b = b`\*a\*b;

print ans\_b;

answer = d`\*d;

ans\_c = inv(answer);

print ans\_c;

ans\_d = ginv(d);

print ans\_d;

cinv = d\*ans\_d;

ans\_e = cinv\*d;

print ans\_e;

ans\_f = ROUND(TRACE(GINV(a)\*a));

print ans\_f;