problem 3

```
% givens
s = zpk('s');
H = 15*(3*s+1)^5/((s+1)^3*(s^2+2*s+10));
Ts = 1/25;

% display
H, Ts
```

```
H =

     3645 (s+0.3333)^5
  -----------------------
  (s+1)^3 (s^2 + 2s + 10)

Continuous-time zero/pole/gain model.
Model Properties
Ts =
0.0400
```

part a

```
% solution
[Ah, Bh, Ch, Dh] = ssdata(canon(H));
Ad = expm(Ah*Ts);
Bd = Ah \ (Ad-eye(size(Ah)))*Bh;
Cd = Ch;
Dd = Dh;

% display
Ad, Bd, Cd, Dd
```

```
Ad = 5×5
    0.9608   -0.0256   -0.0253         0         0
         0    0.9608   -0.0256         0         0
         0         0    0.9608         0         0
         0         0         0    0.9539    0.1150
         0         0         0   -0.1150    0.9539
Bd = 5×1
    0.5968
    0.3022
    0.1012
    0.5486
    9.1941
Cd = 1×5
  -46.5020  -46.5020  -46.5020  -24.1168  -46.6136
Dd =
3.6450e+03
```

part b

```
% solution
[Ad, Bd, Cd, Dd] = ssdata(c2d(H, Ts, 'tustin'));

% display
```

```
Ad, Bd, Cd, Dd
```

```
Ad = 5×5
    0.9608   -0.0260   -0.0260   -0.0076   -0.0409
         0    0.9608   -0.0260   -0.0076   -0.0409
         0         0    0.9608   -0.0076   -0.0409
         0         0         0    0.9540    1.0000
         0         0         0   -0.0132    0.9540
Bd = 5×1
   10.3139
   10.3139
   10.3139
         0
   16.5140
Cd = 1×5
   -8.5642   -8.5642   -8.5642   -2.5004  -13.4826
Dd =
3.4011e+03
```