

```
% Qualifying Exam - EENG 765
% Problem 3b
% Use the Van Loan Method to calculate the covariace matrix and determine
% if state variable one and state variable two are uncorrelated
```

```
syms s1 s2 b
```

```
%% Given
% system matrix
F = [1 0 1;
     0 1 1;
     1 0 0];
% PSD of noise
W = eye(2);
% coefficient matrix for unity white noise disturbances
G = [2*sqrt(2*s1^2*b)    0    ;
     0                  sqrt(2*s2^2*b);
     0                  0     ];
% assume step size of one
dt = 1;
```

```
%% Van Loan Method
A = [F,      G*W*G.'];
    zeros(3), F.'  ];
B = expm(A);
phi = B(1:3,1:3);
Q = phi*B(1:3,4:6);
% replace all nonzero entries with ones
Qz = spones(Q);
```

```
%% Conclusion
% There are no nonzero entries in the covariance matrix, thus all states
% are somewhat correlated because the processes are assumed zero-mean
```