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```
% Generation of a random matrix of rank equal to 3
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```
A = rand(20, 5);
B = matrix_filling(A, 3);
disp('My random matrix of rank equal to 3 is:')
disp(B)
disp('Rank of this matrix is:');
disp(rank(B));
```

```
% Question (a)
```

```
B2 = put_random_zeros(B, 2);
B3 = put_random_zeros(B, 3);
B4 = put_random_zeros(B, 4);
B5 = put_random_zeros(B, 5);
```

```
[U2, S2, V2] = svd(B2);
[U3, S3, V3] = svd(B3);
[U4, S4, V4] = svd(B4);
[U5, S5, V5] = svd(B5);
```

```
disp('Rank of B2 matrix is:');
disp(rank(B2));
disp('Rank of B3 matrix is:');
disp(rank(B3));
disp('Rank of B4 matrix is:');
disp(rank(B4));
disp('Rank of B5 matrix is:');
disp(rank(B5));
```

```
% Question (b)
```

```
B2f = matrix_filling(B2, 3)
B3f = matrix_filling(B3, 3)
B4f = matrix_filling(B4, 3)
B5f = matrix_filling(B5, 3)
```

```
% Question (c)
```

```
var2 = var(var(B2f-B))
var3 = var(var(B3f-B))
var4 = var(var(B4f-B))
var5 = var(var(B5f-B))
```

```
function B = matrix_filling(A, target_rank)
```

```
    [U, S, V] = svd(A);
    B = U(:, 1:target_rank)*S(1:target_rank, 1:target_rank)*V(:, 1:target_rank)';
end
```

```
function A = put_random_zeros(A, zero_num)
```

```
    for i = 1:zero_num
        A(randi(20), randi(5)) = 0;
    end
end
```