I CIA- INT 318-Answer Key

Part A ($10 \times 2 = 20$)

1. Generate a vector of 10 random integers between 1 and 50.

```
v = randi([1 50], 1, 10);
```

2. Function to solve linear equations.

```
function x = solveLinear(A, b)
    x = A\b;   % Solves Ax = b
end
```

3. Record everything in the Command Window.

```
diary output.txt    % Start recording
diary off           % Stop recording
```

4. Slice a 224x224 image into four equal parts.

```
I = imread('image.jpg');
I = imresize(I, [224 224]);

I1 = I(1:112, 1:112, :);
I2 = I(1:112, 113:224, :);
I3 = I(113:224, 1:112, :);
I4 = I(113:224, 113:224, :);
```

5. Find the largest value in each row of a 5x5 matrix (for loop + max).

```
A = randi([1 100], 5, 5);
v = zeros(1, 5);

for i = 1:5
    v(i) = max(A(i,:));
end
```

6. Create a 4x4 matrix with multiples of 5 (for loop).

```
A = zeros(4,4);
count = 1;

```

```
for i = 1:4
    for j = 1:4
        A(i,j) = 5 * count;
        count = count + 1;
    end
end
```

7. Create a 6x6 block matrix.

```
A = [eye(3) zeros(3); ones(3) rand(3)];
```

8. Compute series S using for loop.

```
n = input('Enter n: ');
S = 0;

for k = 1:n
    S = S + sin(k)/k;
end
```

9. Formatting commands:

- format short
- format long
- format short e
- format long e
- format bank
- format rat
- format hex

10. Delete even rows from a 224x224 image.

```
I = imread('image.jpg');
I = imresize(I, [224 224]);
I_new = I(1:2:end, :, :);
```

Part B ($3 \times 10 = 30$)

11(a). App Designer app (conceptual):

- Use `uigetfile` to browse image
- Use `imshow` to display

- Use `size` to get dimensions
- Use `min`, `max`, `mean` for pixel stats

11(b). Binary and multilevel thresholding (for loop + if).

```
I = rgb2gray(imread('image.jpg'));
[m, n] = size(I);

% Binary thresholding
T = 128;
BW = zeros(m, n);
for i = 1:m
    for j = 1:n
        if I(i,j) > T
            BW(i,j) = 1;
        else
            BW(i,j) = 0;
        end
    end
end

% Multilevel thresholding
T1 = 85; T2 = 170;
BW_multi = zeros(m, n);
for i = 1:m
    for j = 1:n
        if I(i,j) < T1
            BW_multi(i,j) = 0;
        elseif I(i,j) < T2
            BW_multi(i,j) = 0.5;
        else
            BW_multi(i,j) = 1;
        end
    end
end
```

12. Matrix manipulation functions.

- User-defined: functions written by user
- Built-in: inv(A), det(A), eig(A), rank(A), pinv(A)
- Commands: size(A), reshape(A,m,n), transpose(A), cat(dim,A,B)

13(a). Search element in array.

```
arr = input('Enter 10 elements: ');
search = input('Enter element to search: ');
idx = find(arr == search);
```

```
4
5  if isempty(idx)
6      disp('Element not present in array');
7  else
8      fprintf('Square root of %d = %.2f\n', search, sqrt(search
       ));
9      fprintf('Index = %d\n', idx);
10 end
```

13(b). Vector manipulation commands:

- Concatenate: [a b], [a; b]
- Transpose: v'
- Slicing: v(2:5)
- Sum/Product: sum(v), prod(v)
- Dot/Cross: dot(u,v), cross(u,v)
- Norm: norm(v)