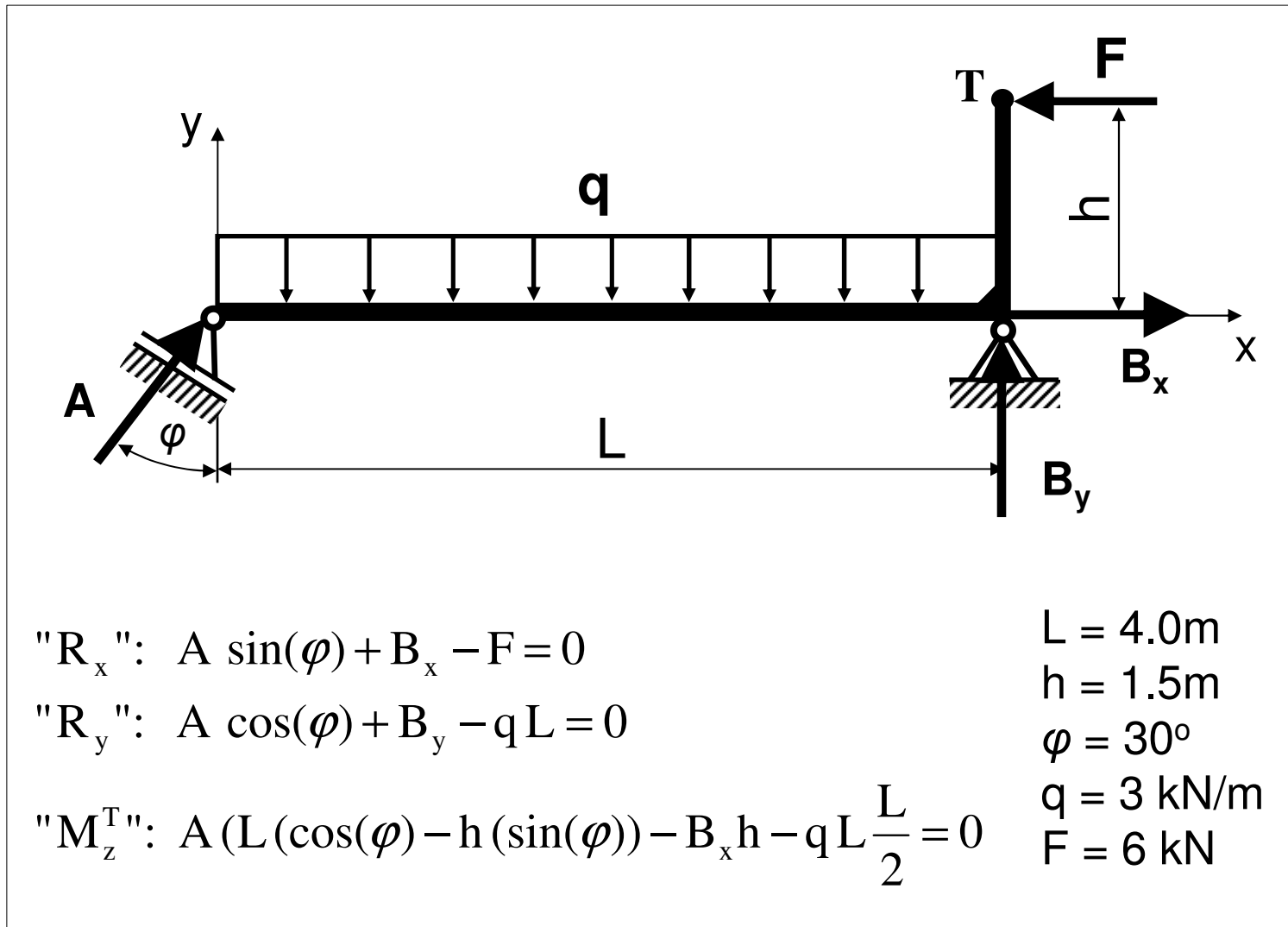


6-1. naloga: izračunajte reakcije v podporah nosilca



6-1. naloga: izračunajte reakcije v podporah nosilca

- preurejen sistem enačb

$$A \sin(\varphi) + B_x = F$$

$$A \cos(\varphi) + B_y = qL$$

$$A (L (\cos(\varphi) - h (\sin(\varphi))) - B_x h = qL^2 / 2$$

- matrični zapis sistema enačb

$$\begin{bmatrix} \sin(\varphi) & 1 & 0 \\ \cos(\varphi) & 0 & 1 \\ (L (\cos(\varphi) - h (\sin(\varphi))) & -h & 0 \end{bmatrix} \begin{Bmatrix} A \\ B_x \\ B_y \end{Bmatrix} = \begin{Bmatrix} F \\ qL \\ qL^2 / 2 \end{Bmatrix}$$

$$[M]\{R\} = \{D\}$$

6-1. naloga: izračunajte reakcije v podporah nosilca

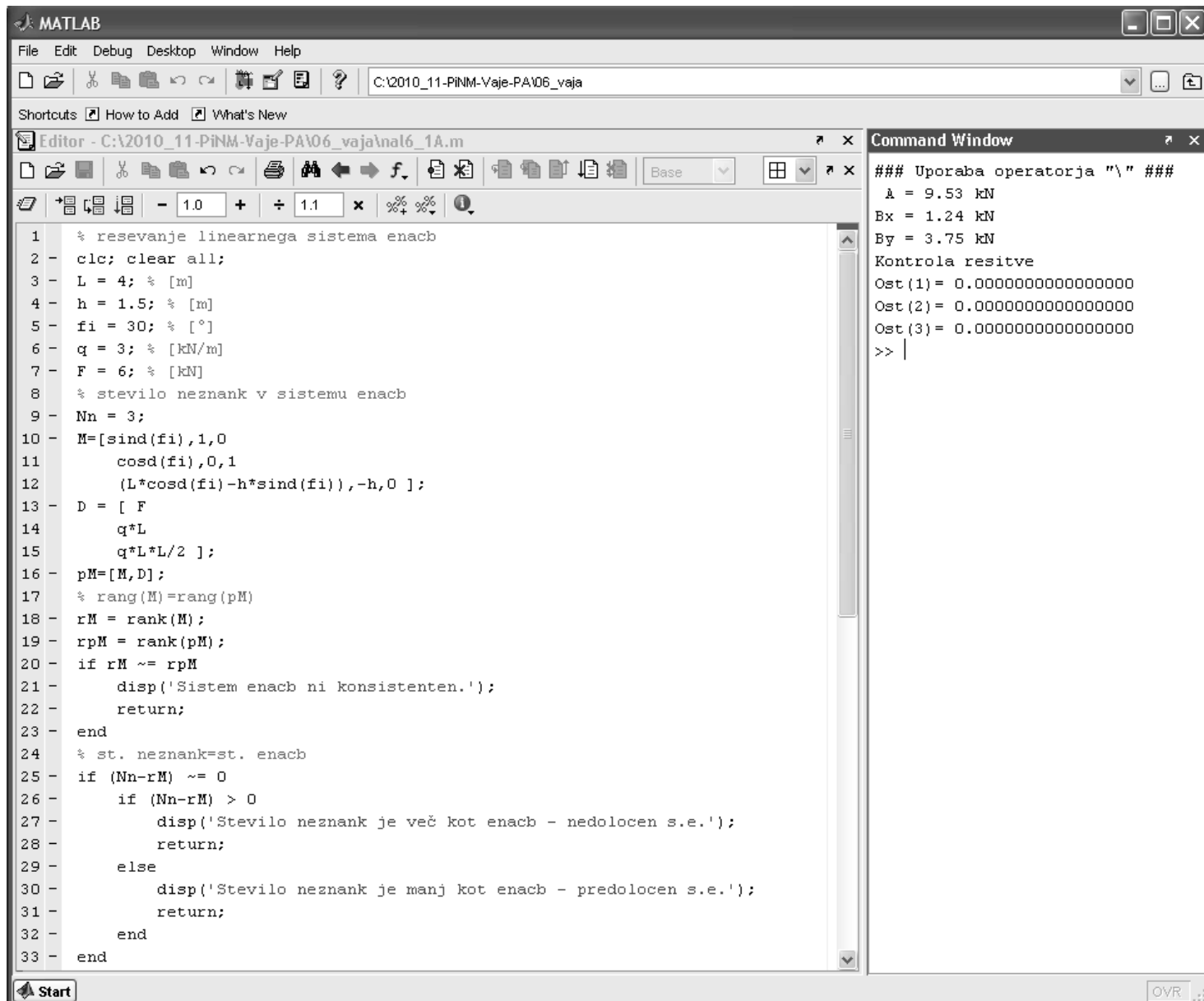
- dobljeni sistem enačb rešite:

A) z uporabo operatorja “\”

B) z Gaussovo metodo z delnim pivotiranjem

C) z izračunom inverzne matrike:  $\{R\} = \{D\} [M]^{-1}$

## 6-1A. naloga: izračunajte reakcije v podporah nosilca

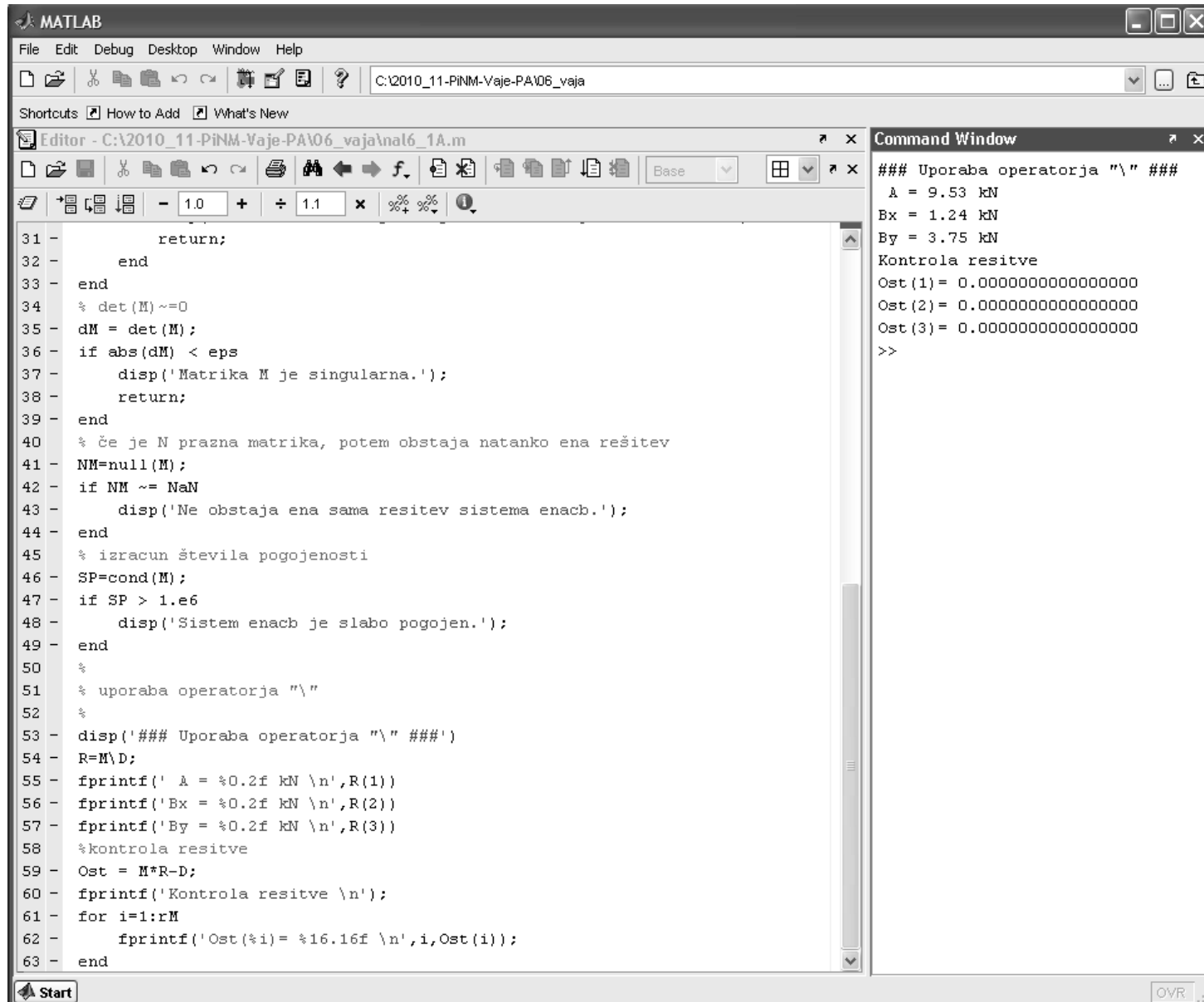


The image shows a MATLAB environment with an Editor window and a Command Window. The Editor window contains a script for solving a linear system of equations. The Command Window shows the output of the script, including the values of the reaction forces and a check for residuals.

```
1 % reševanje linearnega sistema enačb
2 - clc; clear all;
3 - L = 4; % [m]
4 - h = 1.5; % [m]
5 - fi = 30; % [°]
6 - q = 3; % [kN/m]
7 - F = 6; % [kN]
8 % stevilo neznank v sistemu enačb
9 - Nn = 3;
10 - M=[sind(fi),1,0
11     cosd(fi),0,1
12     (L*cosd(fi)-h*sind(fi)),-h,0 ];
13 - D = [ F
14       q*L
15       q*L*L/2 ];
16 - pM=[M,D];
17 % rang(M)=rang(pM)
18 - rM = rank(M);
19 - rpM = rank(pM);
20 - if rM ~= rpM
21 -     disp('Sistem enačb ni konsistenten. ');
22 -     return;
23 - end
24 % st. neznank=st. enačb
25 - if (Nn-rM) ~= 0
26 -     if (Nn-rM) > 0
27 -         disp('Število neznank je več kot enačb - nedoločen s.e. ');
28 -         return;
29 -     else
30 -         disp('Število neznank je manj kot enačb - predoločen s.e. ');
31 -         return;
32 -     end
33 - end
```

```
### Uporaba operatorja "\" ###
A = 9.53 kN
Bx = 1.24 kN
By = 3.75 kN
Kontrola resitve
Ost(1) = 0.0000000000000000
Ost(2) = 0.0000000000000000
Ost(3) = 0.0000000000000000
>> |
```

## 6-1A. naloga: izračunajte reakcije v podporah nosilca



The image shows a MATLAB environment with an Editor window and a Command Window. The Editor window displays a script for solving a system of equations. The Command Window shows the output of the script, including the values of the reaction forces A, Bx, and By, and the results of the residual check.

```
31 -         return;
32 -     end
33 - end
34 - % det(M)~=0
35 - dM = det(M);
36 - if abs(dM) < eps
37 -     disp('Matrika M je singularna.');
```

```
38 -     return;
39 - end
40 - % če je N prazna matrika, potem obstaja natanko ena rešitev
41 - NM=null(M);
42 - if NM ~= NaN
43 -     disp('Ne obstaja ena sama resitev sistema enacb.');
```

```
44 - end
45 - % izracun števila pogojenosti
46 - SP=cond(M);
47 - if SP > 1.e6
48 -     disp('Sistem enacb je slabo pogojen.');
```

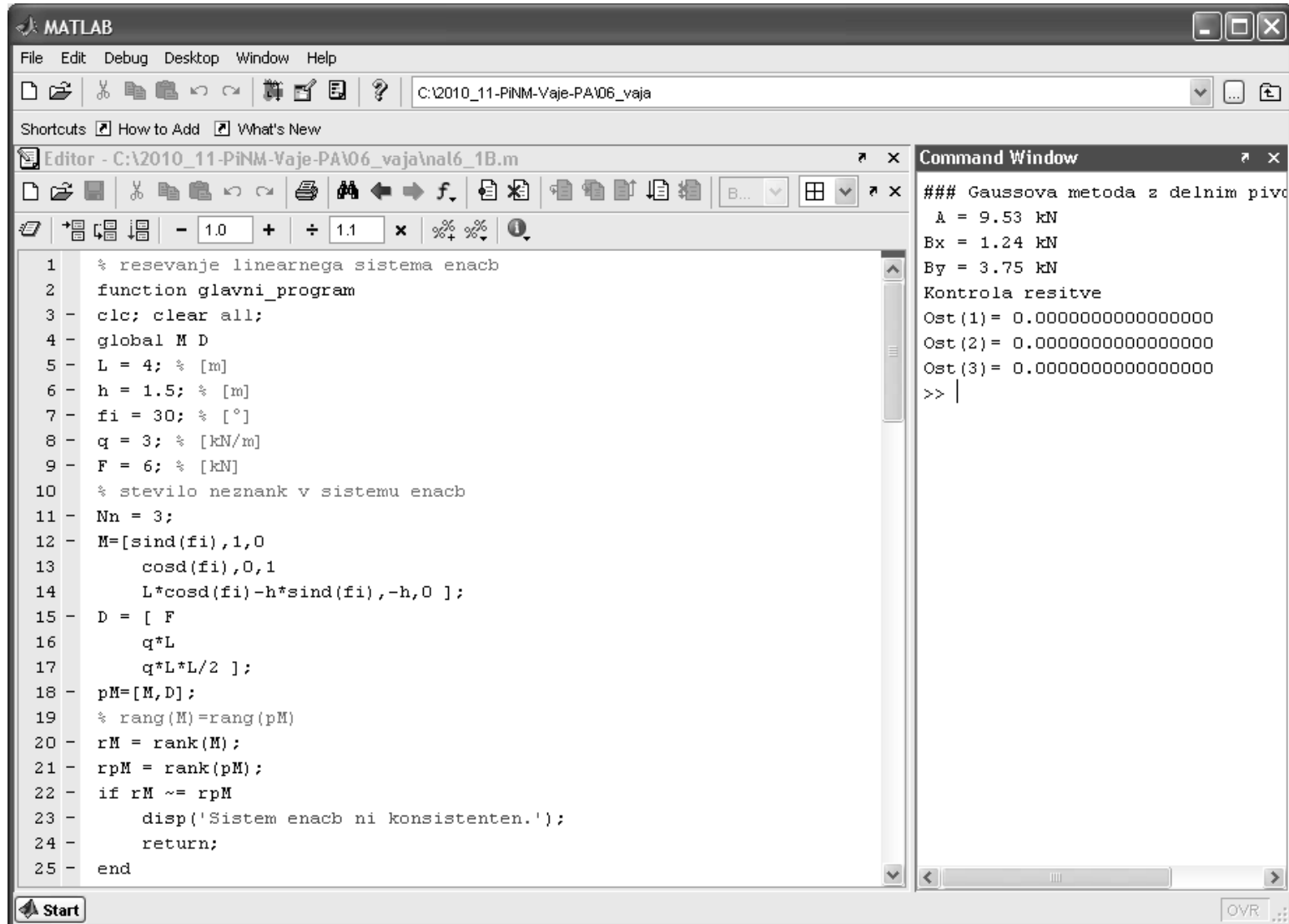
```
49 - end
50 - %
51 - % uporaba operatorja "\"
52 - %
53 - disp('### Uporaba operatorja "\" ###')
```

```
54 - R=M\D;
55 - fprintf(' A = %0.2f kN \n',R(1))
56 - fprintf(' Bx = %0.2f kN \n',R(2))
57 - fprintf(' By = %0.2f kN \n',R(3))
58 - %kontrola resitve
59 - Ost = M*R-D;
60 - fprintf('Kontrola resitve \n');
```

```
61 - for i=1:rM
62 -     fprintf('Ost(%i)= %16.16f \n',i,Ost(i));
63 - end
```

```
### Uporaba operatorja "\" ###
A = 9.53 kN
Bx = 1.24 kN
By = 3.75 kN
Kontrola resitve
Ost(1)= 0.0000000000000000
Ost(2)= 0.0000000000000000
Ost(3)= 0.0000000000000000
>>
```

## 6-1B. naloga: izračunajte reakcije v podporah nosilca

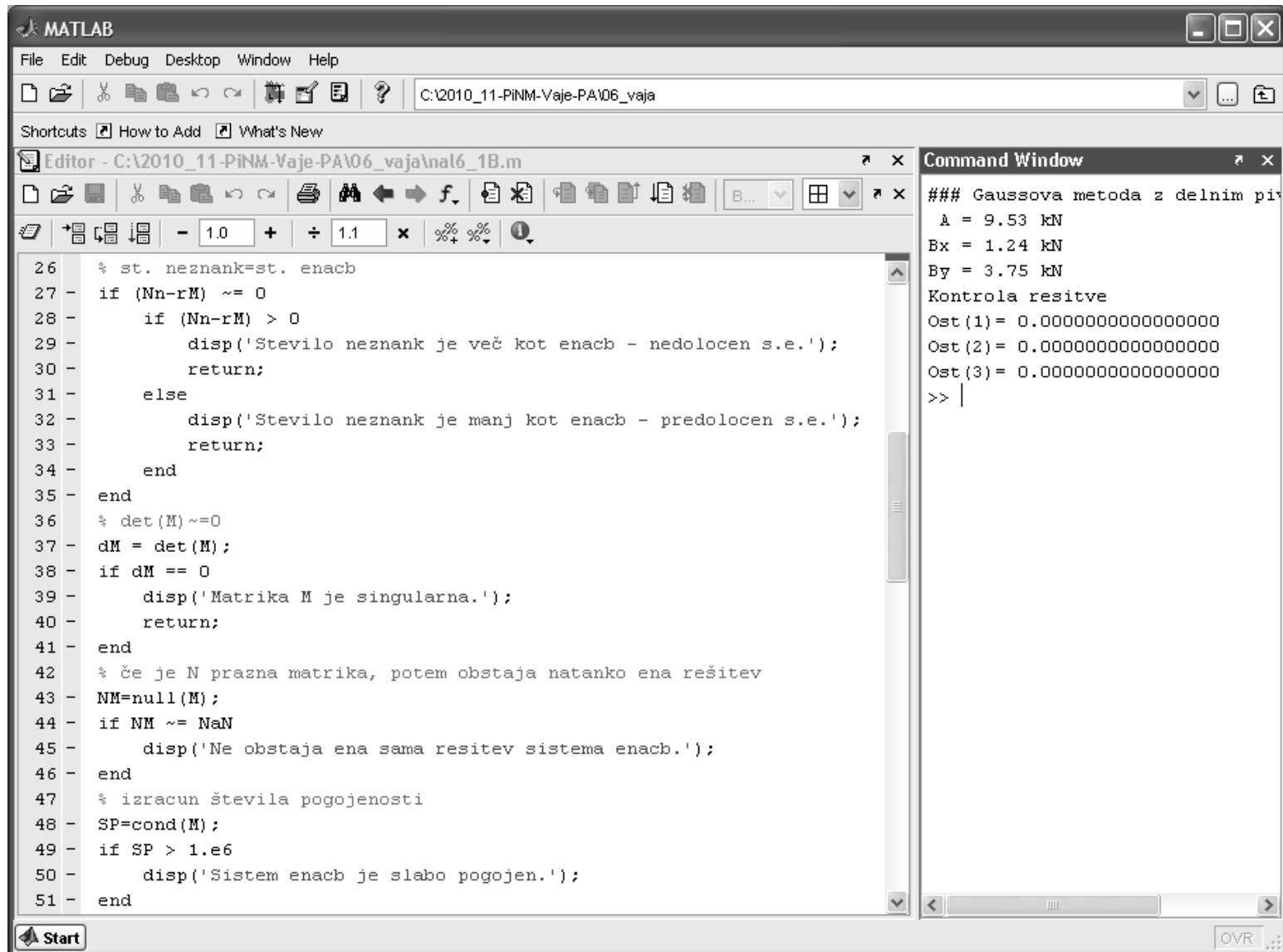


The image shows the MATLAB environment with an editor window and a command window. The editor window contains a script for solving a linear system of equations. The command window shows the execution results, including the reaction forces A, Bx, and By, and the residuals of the solution.

```
1 % reševanje linearnega sistema enačb
2 function glavni_program
3 - clc; clear all;
4 - global M D
5 - L = 4; % [m]
6 - h = 1.5; % [m]
7 - fi = 30; % [°]
8 - q = 3; % [kN/m]
9 - F = 6; % [kN]
10 % stevilo neznank v sistemu enačb
11 - Nn = 3;
12 - M=[sind(fi),1,0
13     cosd(fi),0,1
14     L*cosd(fi)-h*sind(fi),-h,0 ];
15 - D = [ F
16       q*L
17       q*L*L/2 ];
18 - pM=[M,D];
19 % rang(M)=rang(pM)
20 - rM = rank(M);
21 - rpM = rank(pM);
22 - if rM ~= rpM
23 -     disp('Sistem enačb ni konsistenten. ');
24 -     return;
25 - end
```

```
### Gaussova metoda z delnim pivom
A = 9.53 kN
Bx = 1.24 kN
By = 3.75 kN
Kontrola resitve
Ost(1)= 0.0000000000000000
Ost(2)= 0.0000000000000000
Ost(3)= 0.0000000000000000
>> |
```

## 6-1B. naloga: izračunajte reakcije v podporah nosilca



```
26 % st. neznank=st. enacb
27 - if (Nn-rM) ~= 0
28 -     if (Nn-rM) > 0
29 -         disp('Stevilo neznank je več kot enacb - nedolocen s.e.');
```

```
30 -         return;
31 -     else
32 -         disp('Stevilo neznank je manj kot enacb - predolocen s.e.');
```

```
33 -         return;
34 -     end
35 - end
36 % det(M)~=0
37 - dM = det(M);
38 - if dM == 0
39 -     disp('Matrika M je singularna.');
```

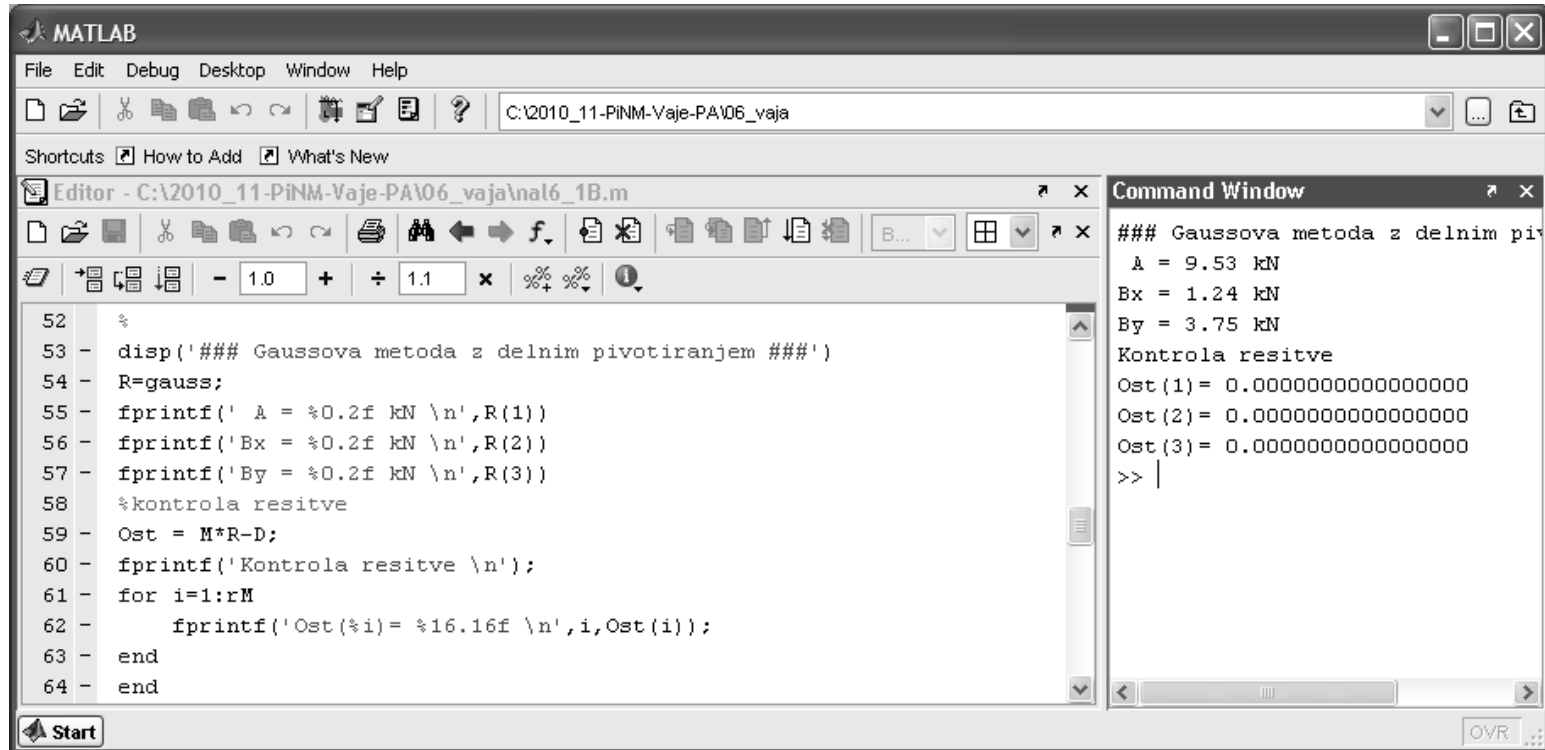
```
40 -     return;
41 - end
42 % če je N prazna matrika, potem obstaja natanko ena rešitev
43 - NM=null(M);
44 - if NM ~= NaN
45 -     disp('Ne obstaja ena sama resitev sistema enacb.');
```

```
46 - end
47 % izracun števila pogojenosti
48 - SP=cond(M);
49 - if SP > 1.e6
50 -     disp('Sistem enacb je slabo pogojen.');
```

```
51 - end
```

```
### Gaussova metoda z delnim piv
A = 9.53 kN
Bx = 1.24 kN
By = 3.75 kN
Kontrola resitve
Ost(1)= 0.0000000000000000
Ost(2)= 0.0000000000000000
Ost(3)= 0.0000000000000000
>> |
```

## 6-1B. naloga: izračunajte reakcije v podporah nosilca



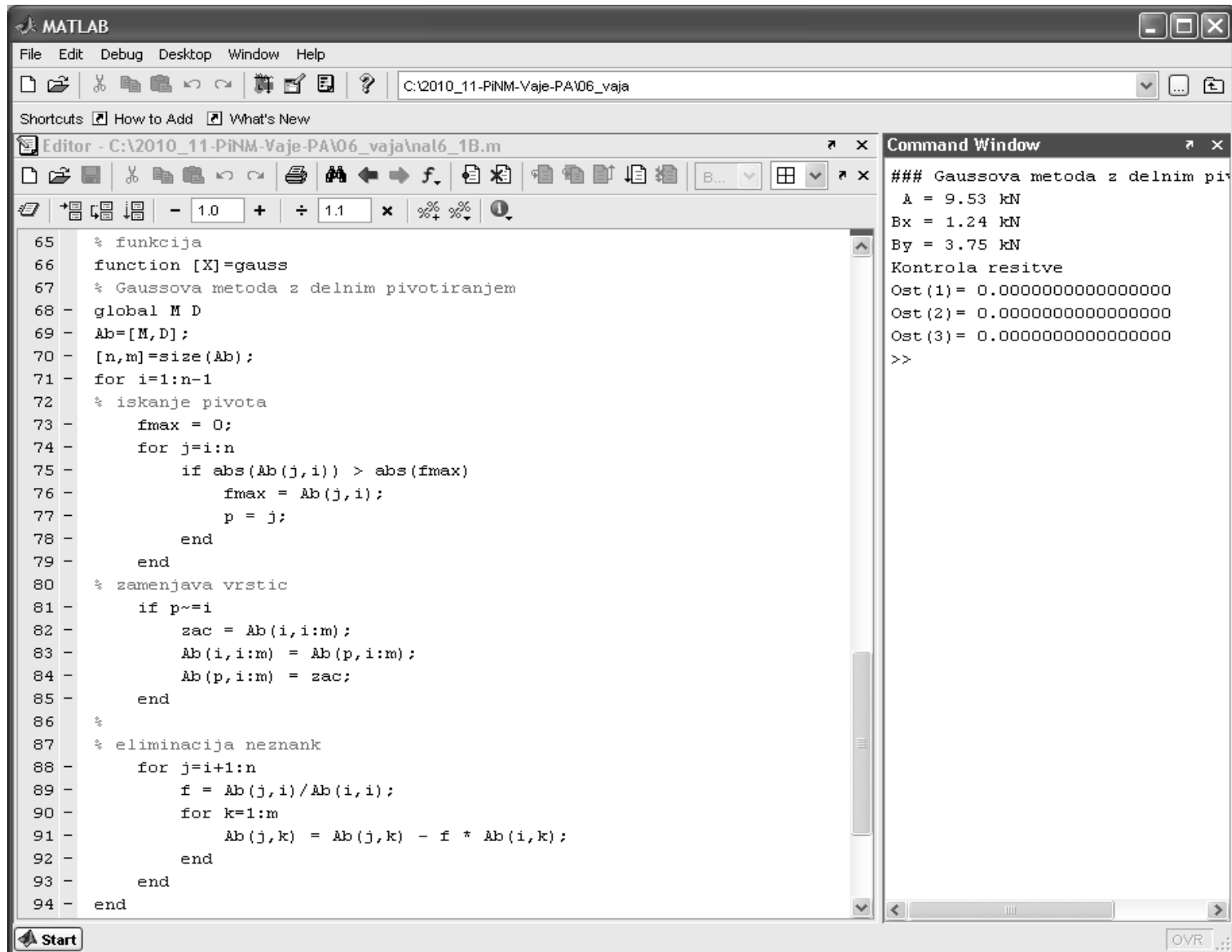
The image shows a MATLAB environment with an editor window and a command window. The editor window contains a script for solving a system of equations using the Gauss method. The command window shows the output of the script, including the reaction values and the residual control results.

```
52 %  
53 - disp('### Gaussova metoda z delnim pivotiranjem ###')  
54 - R=gauss;  
55 - fprintf(' A = %0.2f kN \n',R(1))  
56 - fprintf('Bx = %0.2f kN \n',R(2))  
57 - fprintf('By = %0.2f kN \n',R(3))  
58 %kontrola resitve  
59 - Ost = M*R-D;  
60 - fprintf('Kontrola resitve \n');  
61 - for i=1:rM  
62 -     fprintf('Ost(%i)= %16.16f \n',i,Ost(i));  
63 - end  
64 - end
```

```
### Gaussova metoda z delnim pivotiranjem ###  
A = 9.53 kN  
Bx = 1.24 kN  
By = 3.75 kN  
Kontrola resitve  
Ost(1)= 0.0000000000000000  
Ost(2)= 0.0000000000000000  
Ost(3)= 0.0000000000000000  
>> |
```



## 6-1B. naloga: izračunajte reakcije v podporah nosilca

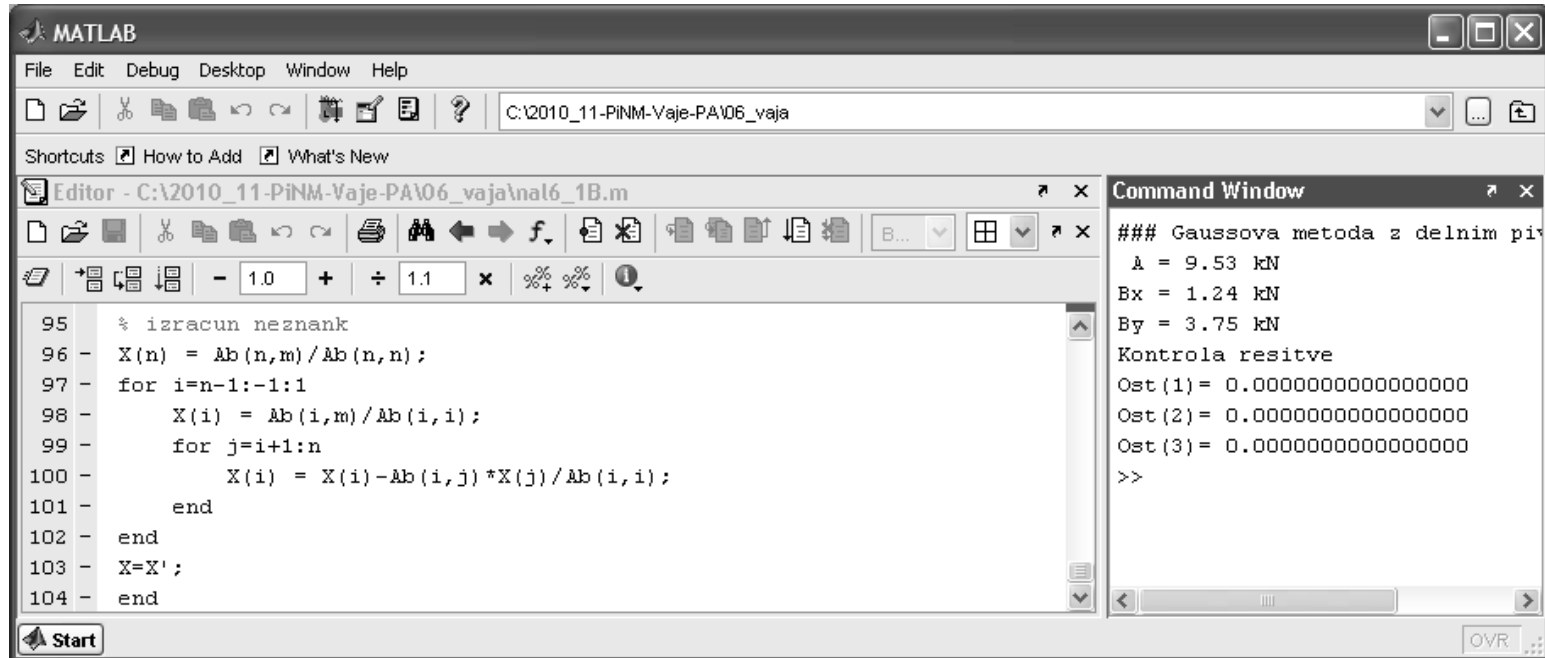


The image shows a MATLAB environment with an Editor window and a Command Window. The Editor window contains a script for solving a system of linear equations using Gaussian elimination with partial pivoting. The Command Window shows the output of the script, including the values of the reaction forces A, Bx, and By, and the residual values.

```
65 % funkcija
66 function [X]=gauss
67 % Gaussova metoda z delnim pivotiranjem
68 - global M D
69 - Ab=[M,D];
70 - [n,m]=size(Ab);
71 - for i=1:n-1
72 % iskanje pivota
73 - fmax = 0;
74 - for j=i:n
75 -     if abs(Ab(j,i)) > abs(fmax)
76 -         fmax = Ab(j,i);
77 -         p = j;
78 -     end
79 - end
80 % zamenjava vrstic
81 - if p~=i
82 -     zac = Ab(i,i:m);
83 -     Ab(i,i:m) = Ab(p,i:m);
84 -     Ab(p,i:m) = zac;
85 - end
86 %
87 % eliminacija neznank
88 - for j=i+1:n
89 -     f = Ab(j,i)/Ab(i,i);
90 -     for k=1:m
91 -         Ab(j,k) = Ab(j,k) - f * Ab(i,k);
92 -     end
93 - end
94 - end
```

```
### Gaussova metoda z delnim piv
A = 9.53 kN
Bx = 1.24 kN
By = 3.75 kN
Kontrola resitve
Ost(1) = 0.0000000000000000
Ost(2) = 0.0000000000000000
Ost(3) = 0.0000000000000000
>>
```

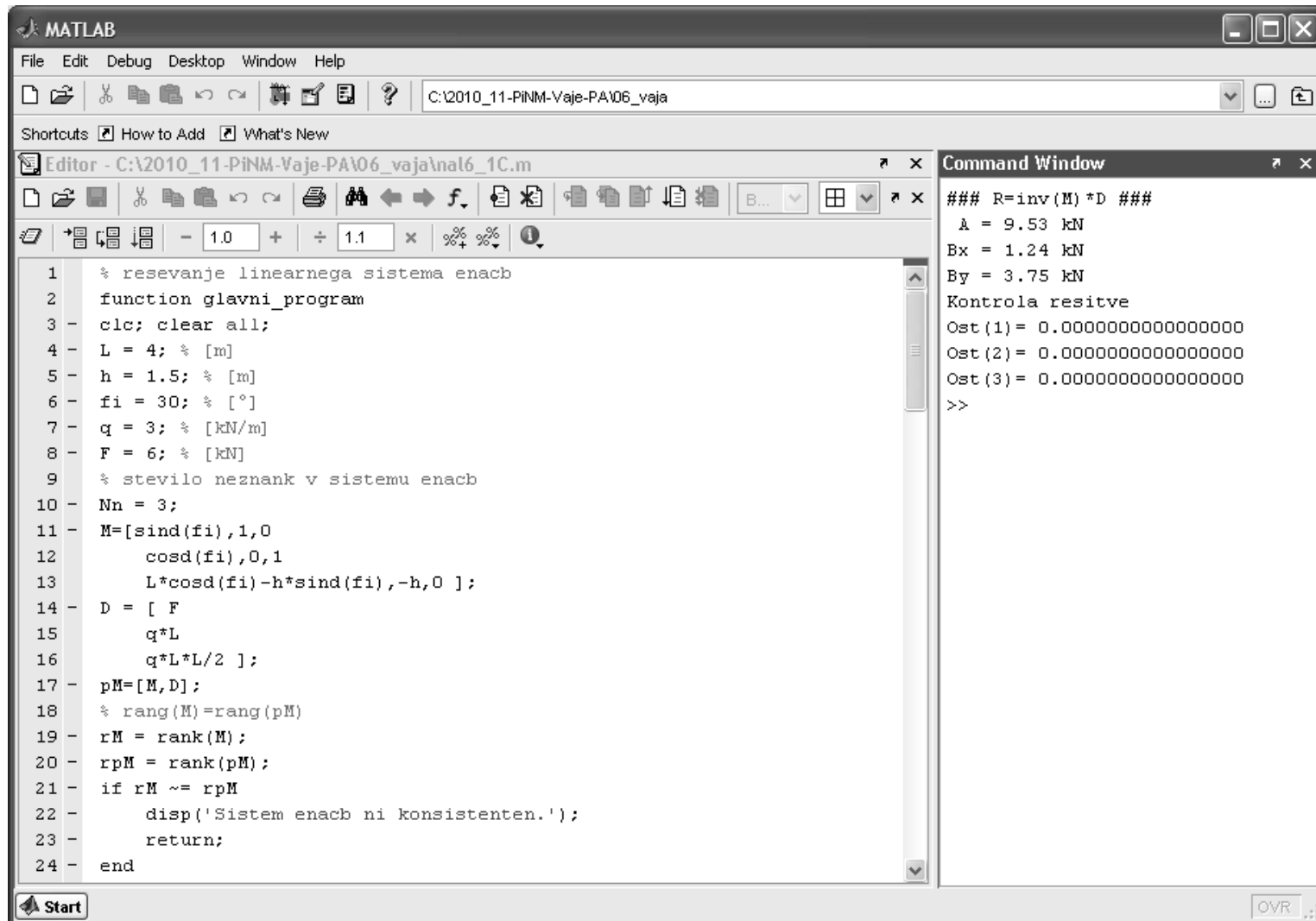
## 6-1B. naloga: izračunajte reakcije v podporah nosilca



```
95 % izracun neznank
96 - X(n) = Ab(n,m)/Ab(n,n);
97 - for i=n-1:-1:1
98 -     X(i) = Ab(i,m)/Ab(i,i);
99 -     for j=i+1:n
100 -         X(i) = X(i)-Ab(i,j)*X(j)/Ab(i,i);
101 -     end
102 - end
103 - X=X';
104 - end
```

```
### Gaussova metoda z delnim piv
A = 9.53 kN
Bx = 1.24 kN
By = 3.75 kN
Kontrola resitve
Ost(1)= 0.0000000000000000
Ost(2)= 0.0000000000000000
Ost(3)= 0.0000000000000000
>>
```

## 6-1C. naloga: izračunajte reakcije v podporah nosilca



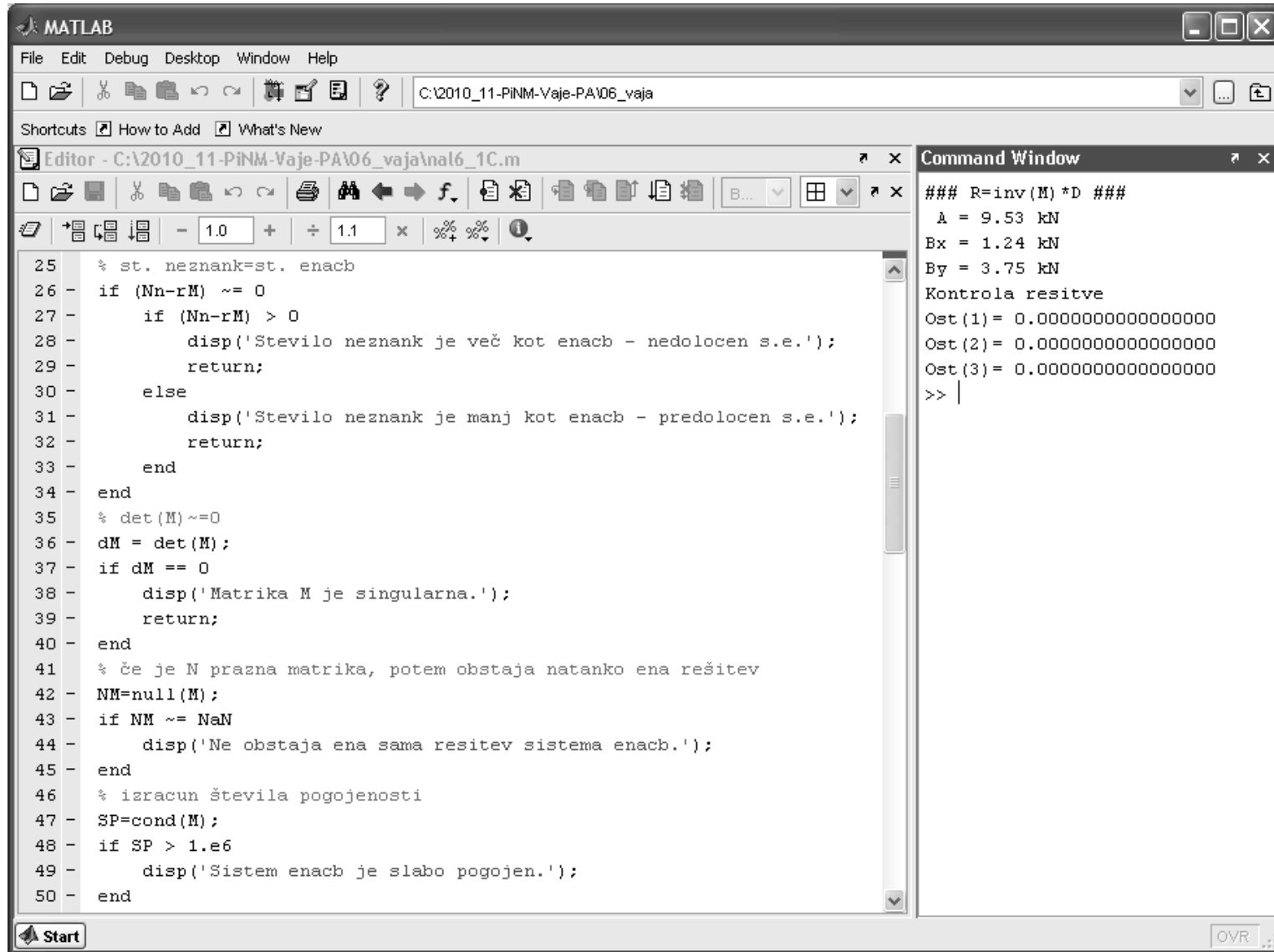
The image shows a MATLAB environment with an Editor window and a Command Window. The Editor window contains a script named 'nal6\_1C.m' with the following code:

```
1 % reševanje linearnega sistema enačb
2 function glavni_program
3 - clc; clear all;
4 - L = 4; % [m]
5 - h = 1.5; % [m]
6 - fi = 30; % [°]
7 - q = 3; % [kN/m]
8 - F = 6; % [kN]
9 % stevilo neznank v sistemu enačb
10 - Nn = 3;
11 - M=[sind(fi),1,0
12     cosd(fi),0,1
13     L*cosd(fi)-h*sind(fi),-h,0 ];
14 - D = [ F
15       q*L
16       q*L*L/2 ];
17 - pM=[M,D];
18 % rang(M)=rang(pM)
19 - rM = rank(M);
20 - rpM = rank(pM);
21 - if rM ~= rpM
22 -     disp('Sistem enačb ni konsistenten. ');
23 -     return;
24 - end
```

The Command Window shows the execution results:

```
### R=inv(M)*D ###
A = 9.53 kN
Bx = 1.24 kN
By = 3.75 kN
Kontrola resitve
Ost(1) = 0.0000000000000000
Ost(2) = 0.0000000000000000
Ost(3) = 0.0000000000000000
>>
```

## 6-1C. naloga: izračunajte reakcije v podporah nosilca



```
25 % st. neznank=st. enacb
26 - if (Nn-rM) ~= 0
27 -     if (Nn-rM) > 0
28 -         disp('Stevilo neznank je več kot enacb - nedolocen s.e.');
```

```
29 -         return;
30 -     else
31 -         disp('Stevilo neznank je manj kot enacb - predolocen s.e.');
```

```
32 -         return;
33 -     end
34 - end
35 % det(M)~=0
36 - dM = det(M);
37 - if dM == 0
38 -     disp('Matrika M je singularna.');
```

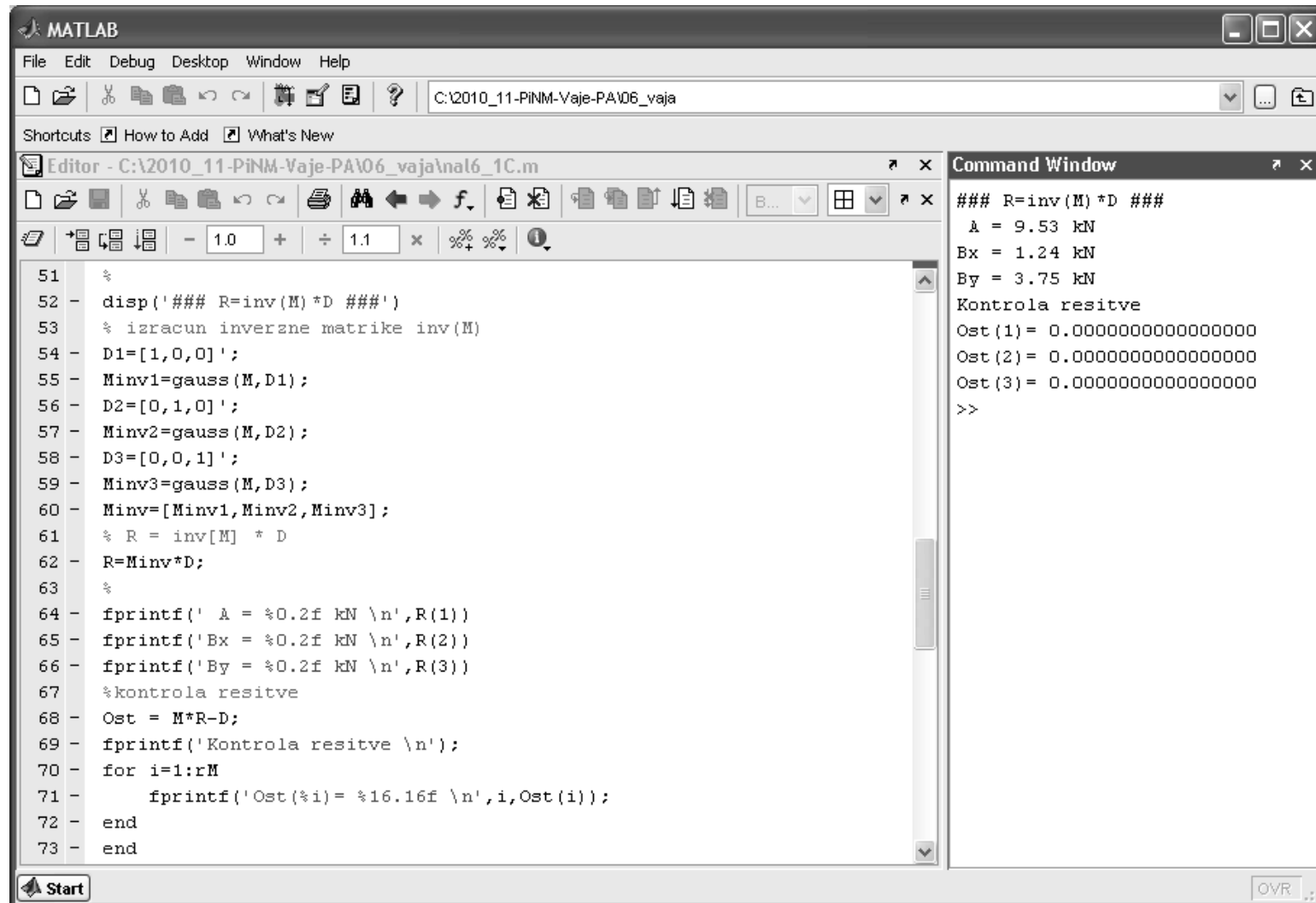
```
39 -     return;
40 - end
41 % če je N prazna matrika, potem obstaja natanko ena rešitev
42 - NM=null(M);
43 - if NM ~= NaN
44 -     disp('Ne obstaja ena sama resitev sistema enacb.');
```

```
45 - end
46 % izracun števila pogojenosti
47 - SP=cond(M);
48 - if SP > 1.e6
49 -     disp('Sistem enacb je slabo pogojen.');
```

```
50 - end
```

```
### R=inv(M)*D ###
A = 9.53 kN
Bx = 1.24 kN
By = 3.75 kN
Kontrola resitve
Ost(1)= 0.0000000000000000
Ost(2)= 0.0000000000000000
Ost(3)= 0.0000000000000000
>> |
```

## 6-1C. naloga: izračunajte reakcije v podporah nosilca



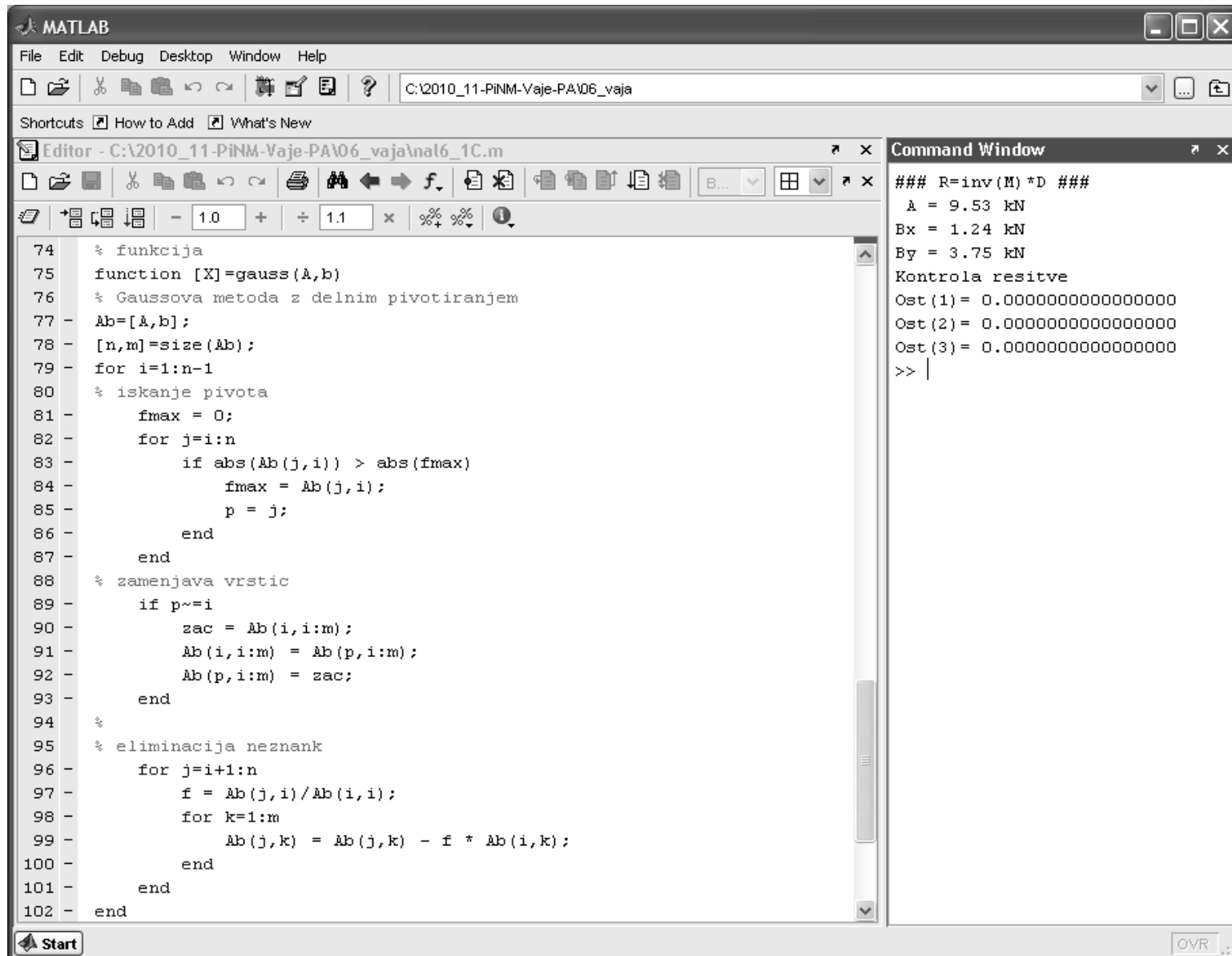
The image shows a MATLAB environment with an Editor window and a Command Window. The Editor window contains a script named 'nal6\_1C.m' with the following code:

```
51 %  
52 - disp('### R=inv(M)*D ###')  
53 % izracun inverzne matrike inv(M)  
54 - D1=[1,0,0]';  
55 - Minv1=gauss(M,D1);  
56 - D2=[0,1,0]';  
57 - Minv2=gauss(M,D2);  
58 - D3=[0,0,1]';  
59 - Minv3=gauss(M,D3);  
60 - Minv=[Minv1,Minv2,Minv3];  
61 % R = inv[M] * D  
62 - R=Minv*D;  
63 %  
64 - fprintf(' A = %0.2f kN \n',R(1))  
65 - fprintf(' Bx = %0.2f kN \n',R(2))  
66 - fprintf(' By = %0.2f kN \n',R(3))  
67 %kontrola resitve  
68 - Ost = M*R-D;  
69 - fprintf(' Kontrola resitve \n');  
70 - for i=1:rM  
71 -     fprintf(' Ost(%i)= %16.16f \n',i,Ost(i));  
72 - end  
73 - end
```

The Command Window displays the output of the script:

```
### R=inv(M)*D ###  
A = 9.53 kN  
Bx = 1.24 kN  
By = 3.75 kN  
Kontrola resitve  
Ost(1)= 0.0000000000000000  
Ost(2)= 0.0000000000000000  
Ost(3)= 0.0000000000000000  
>>
```

## 6-1C. naloga: izračunajte reakcije v podporah nosilca

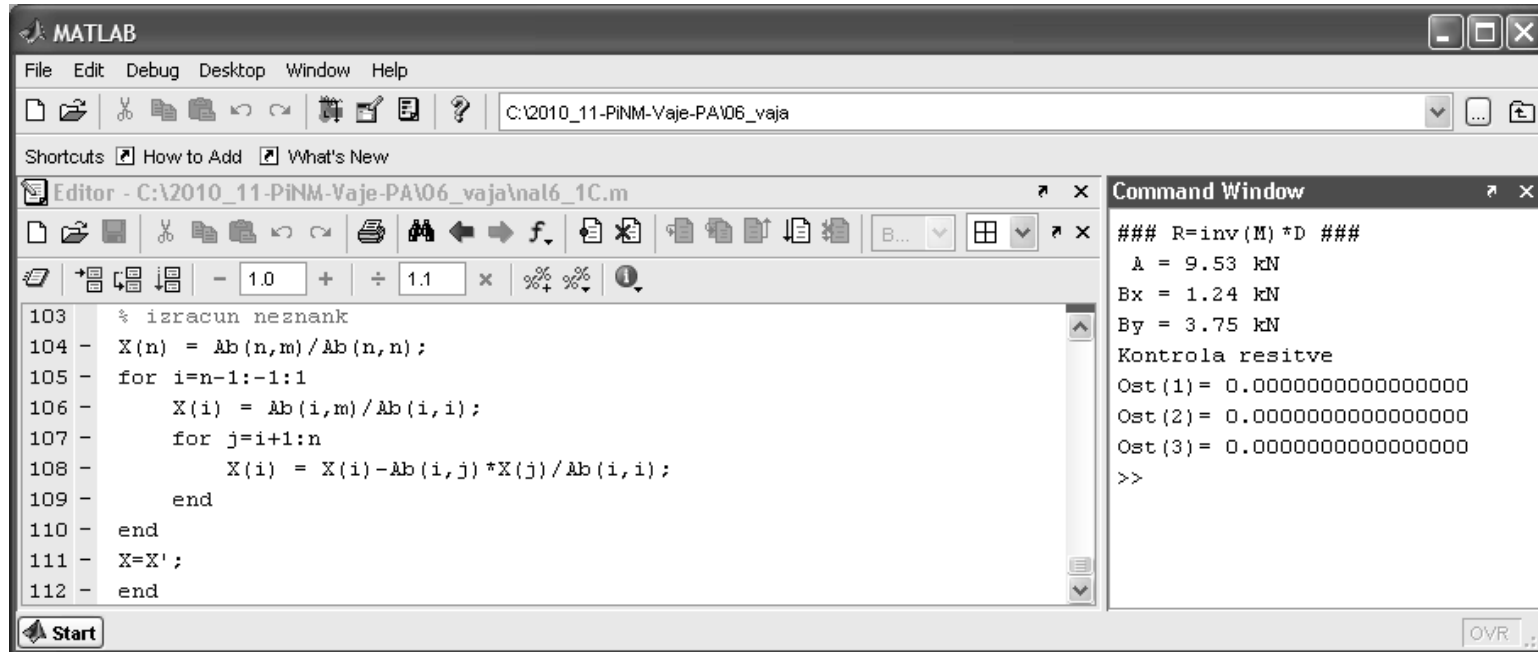


The image shows a MATLAB window with a script editor and a command window. The script editor contains a function named 'gauss' that implements the Gaussian elimination method. The command window shows the results of running the script, including the inverse of matrix M, the reaction forces A, Bx, and By, and the residuals.

```
74 % funkcija
75 function [X]=gauss(A,b)
76 % Gaussova metoda z delnim pivotiranjem
77 - Ab=[A,b];
78 - [n,m]=size(Ab);
79 - for i=1:n-1
80 % iskanje pivota
81 -     fmax = 0;
82 -     for j=i:n
83 -         if abs(Ab(j,i)) > abs(fmax)
84 -             fmax = Ab(j,i);
85 -             p = j;
86 -         end
87 -     end
88 % zamenjava vrstic
89 -     if p~=i
90 -         zac = Ab(i,i:m);
91 -         Ab(i,i:m) = Ab(p,i:m);
92 -         Ab(p,i:m) = zac;
93 -     end
94 %
95 % eliminacija neznank
96 -     for j=i+1:n
97 -         f = Ab(j,i)/Ab(i,i);
98 -         for k=1:m
99 -             Ab(j,k) = Ab(j,k) - f * Ab(i,k);
100 -         end
101 -     end
102 - end
```

```
### R=inv(M)*D ###
A = 9.53 kN
Bx = 1.24 kN
By = 3.75 kN
Kontrola resitve
Ost(1)= 0.0000000000000000
Ost(2)= 0.0000000000000000
Ost(3)= 0.0000000000000000
>> |
```

## 6-1C. naloga: izračunajte reakcije v podporah nosilca



The image shows the MATLAB environment. The Editor window displays a script for calculating reactions. The Command Window shows the results of the script execution.

```
103 % izracun neznank
104 - X(n) = Ab(n,m)/Ab(n,n);
105 - for i=n-1:-1:1
106 -     X(i) = Ab(i,m)/Ab(i,i);
107 -     for j=i+1:n
108 -         X(i) = X(i)-Ab(i,j)*X(j)/Ab(i,i);
109 -     end
110 - end
111 - X=X';
112 - end
```

```
### R=inv(M)*D ###
A = 9.53 kN
Bx = 1.24 kN
By = 3.75 kN
Kontrola resitve
Ost(1)= 0.0000000000000000
Ost(2)= 0.0000000000000000
Ost(3)= 0.0000000000000000
>>
```