

Time: 90 minutes
試卷隨答案卷繳回

Total 100%

1.

$$\frac{d^2u}{dx^2} + u = 4x, 0 < x < 1$$

$$u(0) = 0, u(1) = 1$$

(a)

(b)

$$\frac{d^2u}{dx^2} + u - 4x = 0$$

$$\int w \frac{d^2u}{dx^2} dx + \int w u dx - 4 \int w x dx = 0$$

$$\int w \frac{d}{dx} \left(\frac{du}{dx} \right) dx + \int w u dx - 4 \int w x dx = 0$$

$$w \frac{du}{dx} \Big|_{x=0}^{x=1} - \int_0^1 \frac{dw}{dx} \left(\frac{du}{dx} \right) dx + \int_0^1 w u dx - 4 \int_0^1 w x dx = 0$$

Find $u(x)$ among the smooth functions that satisfy $u(0) = 0$, $u(1) = 1$ such that

$$\int_0^1 \frac{dw}{dx} \left(\frac{du}{dx} \right) dx = \int_0^1 w u dx - 4 \int_0^1 w x dx = 0 \quad \forall w \quad w(0) = 0, w(1) = 0$$

2.

$$\frac{d}{dx} \left(EA \frac{du}{dx} \right) + b(x) = 0 \quad \text{where } b(x) = -4x \quad EA = x$$

$$u^e(x) = \frac{1}{x_2 - x_1} \begin{bmatrix} x_2 - x & x - x_1 \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \end{bmatrix}$$

$$B = \frac{1}{x_2 - x_1} \begin{bmatrix} -1 & 1 \end{bmatrix}$$

$$\mathbf{K} = \int_{x_1}^{x_2} \mathbf{B}^T \mathbf{A} \mathbf{E} \mathbf{B} dx$$

$$= \frac{1}{(x_2 - x_1)^2} \int_{x_1}^{x_2} \begin{bmatrix} -1 \\ 1 \end{bmatrix} x \begin{bmatrix} -1 & 1 \end{bmatrix} dx$$

$$= \frac{x_2 + x_1}{2(x_2 - x_1)} \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$$

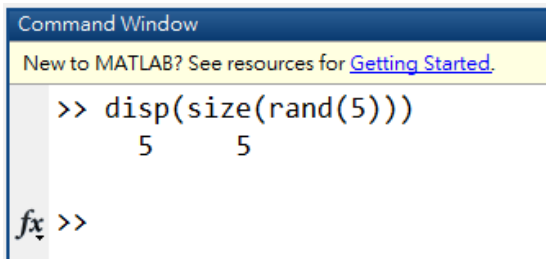
$$\mathbf{f}_{\Omega}^e = \int_{x_1}^{x_2} \mathbf{N}^T b(x) dx$$

$$= \int_{x_1}^{x_2} \frac{1}{x_2 - x_1} \begin{bmatrix} x_2 - x \\ x - x_1 \end{bmatrix} (-4x) dx$$

$$= \frac{2(x_1 - x_2)}{3} \begin{bmatrix} 2x_1 + x_2 \\ x_1 + 2x_2 \end{bmatrix}$$

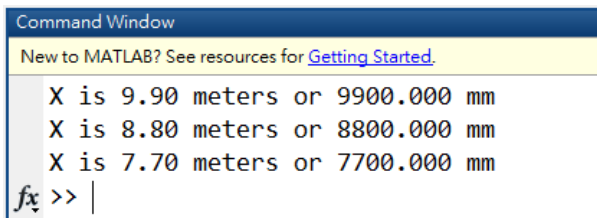
3.

```
| disp(size(rand(5)))
```



```
Command Window
New to MATLAB? See resources for Getting Started.
>> disp(size(rand(5)))
     5     5
fx >>
```

```
| A1 = [9.9, 9900];
| A2 = [8.8, 7.7 ; ...
|      8800, 7700];
| formatSpec = 'X is %4.2f meters or %8.3f mm\n';
| fprintf(formatSpec,A1,A2)
```



```
Command Window
New to MATLAB? See resources for Getting Started.
X is 9.90 meters or 9900.000 mm
X is 8.80 meters or 8800.000 mm
X is 7.70 meters or 7700.000 mm
fx >> |
```

```
A = [1 2 3 4; 5 6 7 8; 9 10 11 12; 13 14 15 16];  
disp(A(:,2:3))  
disp(A(:, :))  
disp(A(:))
```

```
Command Window  
New to MATLAB? See resources for Getting Started.  
  
2 3  
6 7  
10 11  
14 15  
  
1 2 3 4  
5 6 7 8  
9 10 11 12  
13 14 15 16  
  
1  
5  
9  
13  
2  
6  
10  
14  
3  
7  
11  
15  
4  
8  
12  
16  
  
fx >> |
```