

COMPUTER AIDED ENGINEERING LAB [ME404]



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PLOTTING AND VISUALIZATION

- **Types of Plots in MATLAB:**

- 2D plots
- Multiple plots
- Special 2D plots (bar, histogram, pie)
- 3D plots (mesh, surf, contour)

2D PLOTS

- **Command used – plot()**

- **E.g**

- Plot a straight line.
- Plot a parabola.
- Plot stress- strain curve.

strain = 0:0.0005:0.003

E = 210e9

stress = E * strain

X = 0 to 4*pi [step size=0.01]

Y = sin(X)

Plot(x,y)

3D PLOTS

Used to plot in 3 dimensional

Command used in this is – plot3

Eg. Plot a helix in 3D

- $t = 0:0.1:10*\pi$
- $X = \cos(t)$
- $Y = \sin(t)$
- $Z = t;$
- `Plot3(x,y,z)`

SURFACE PLOTTING

- Used to visualize the surface in 3D
- Command used is - surf
- Eg plot $z = x.^2 + y.^2$
 `[x, y] = meshgrid(-5:0.5:5, -5:0.5:5);`
 `surf(x, y, z);`

COUNTOUR PLOTTING

- A contour plot is a 2D representation of a 3D surface where lines connect points of equal value (like height, temperature, or pressure).
- Command used is – contour
- Eg `[x, y] = meshgrid(-5:0.1:5, -5:0.1:5)`
- $z = x.^2 + y.^2$
- `contour(x, y, z)`

EXERCISE

- A simply supported steel beam of length $L=2L = 2L=2$ m is subjected to a point load $W=500W = 500W=500$ N at the center.

The slope and deflection are given by:

- $\delta(x) = \frac{Wx(3L^2-4x^2)}{48EI}$ & $\theta(x) = \frac{W(L^2-4x^2)}{16EI}$
- $E = 200 \times 10^9$, $I = 4 \times 10^{-6} m^4$.

Safe if $\delta < 1$ mm

Warning if 1–3 mm

Fail if > 3 mm

Amplitude ratio in vibration is given by, $\frac{A}{X_s} = \frac{1}{\sqrt{(1-r^2)^2 + (2\zeta r)^2}}$. Show the variation

of Amplitude ratio with respect to frequency ratio (r) in the range of 0 to 3 with steps of 0.01 for $\zeta = [0.1 \ 0.4 \ 0.9 \ 1.2 \ 2]$.

Plot the polynomial $y = x^4 + x^2 - 1$ between $x = -2$ and $x = 2$ (using fifty points).

Plot three curves as a function of t : $y1 = \sin(t)$, $y2 = \sin(t - 0.25)$; $y3 = \sin(t - 0.5)$ for t ranging from 0 to 2π in increments of $\pi/100$. Use different style identifier strings to plot.

Plot the function $f = t \sin(t)$ using *fplot*.

Easy version of plot is *ezplot*. Solve the questions using this