

Question 4a.

• Command window

clc

clear

close all

Sym $n(t)$

$$\text{eqn} = \text{diff}(n, t, 2) - \text{diff}(n, t) - 12 * n = 144 * (t^3) + 12.5;$$

$$\text{cond} = n(0) == 5, \text{diff}(n, t, 2) == -0.5;$$

$$ySol = \text{dsolve}(\text{eqn}, \text{cond})$$

$$t = 0 : 0.1 : 1.5$$

$$Ebube = \text{subs}(ySol)$$

$$\text{fplot}(Ebube)$$

grid on

$$\text{legend}(Ebube, \text{Location}, 'best')$$

Question 4b.

• Command window

• clc

• clear

• close

• Sym $x(t)$ $y(t)$

$$\text{eqn1} = \text{diff}(y, t) - x * x == \text{exp}(-2 * t);$$

$$\text{eqn2} = \text{diff}(x, t) + y * \text{exp}(-t);$$

$$\text{eqn3} = [\text{eqn1}, \text{eqn2}]$$

$$\text{cond} = (0) == 0, y(0) == 0;$$

$$\text{Ans} = \text{dsolve}(\text{eqns}, \text{cond})$$

$$xSol(t) = \text{Ans} * x$$

$$ySol(t) = \text{Ans} * y$$

ii. Visualizing the solution on graph separately Contour work.

• `fplot(xsol)`

`fplot(ysol)`

`grid on`

`legend('xsol', 'location', 'best')`

`legend('ysol', 'location', 'best')`

iii. Visualizing the solution on graphs together Contour

`fplot(xsol)`

`hold on`

`fplot(ysol)`

`grid on`

`legend('xsol', 'ysol', 'location', 'best')`

Question 4C

Command window

`clc`

`clear`

`close all`

Syms `t s w x k a`

$$x = k * \exp(-a * t) * \sin(5 * w * t) + \cos(3 * w * t)$$

$$F = \text{laplace}(x, t, s)$$

`Simplify(F)`

`pretty(ans)`

ii) Command window

`clc`

`clear`

`close all`

$\mathcal{L}^{-1} \{ F(s) \}$

$$F(s) = \frac{P_i}{[(s^2) + 15P_i s + 24(P_i^3)]}$$

ilaplace (F)

simplify (ans)

pretty (ans)