3.STEP RESPONSE OF A TRANSFER FUNCTION

AIM:

To obtain the step response of a transfer function of the given system using MATLAB.

APPARATUS:

Software: MATLAB

THEORY:

A step signal is a signal whose value changes from one level to another level in zero time. Mathematically, the step signal is represented as given below:

$r(t) = u(t)$, where

$u(t) = 1; t > 0$

$= 0; t < 0$

In the Laplace transform form,

$$R(s) = \frac{1}{s}$$

The step response of the given transfer function is obtained as follows:

$$T(s) = \frac{C(s)}{R(s)}$$

So, $C(s) = R(s)T(s)$

$$C(s) = \frac{T(s)}{s}$$

The output is given by,

$c(t) = L^{-1}[C(s)]$

MATLAB PROGRAM:

num = input('enter the numerator of the transfer function')

den = input('enter the denominator of the transfer function')

step(num,den)

EXAMPLE:

Obtain the step response of the transfer function given below:

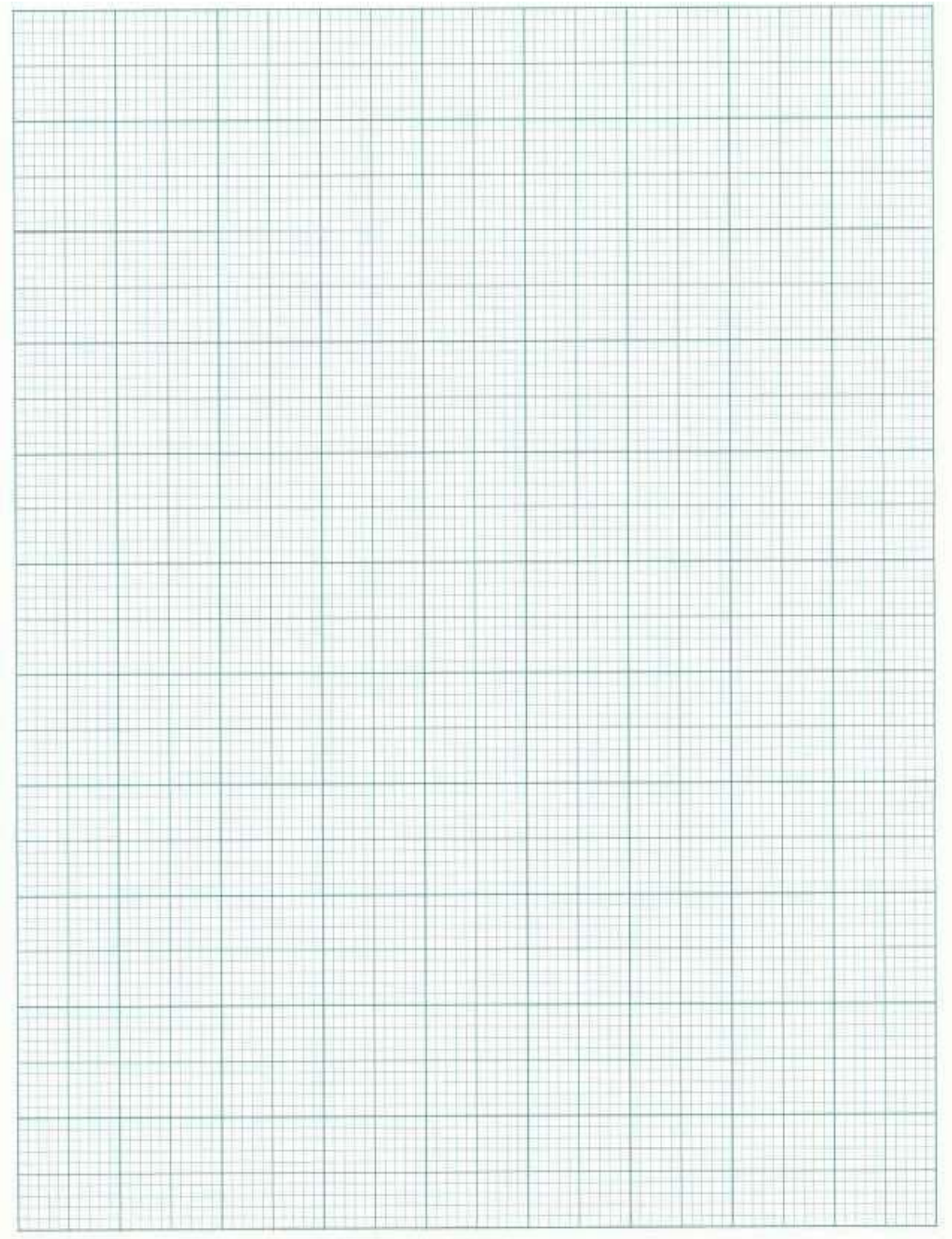
$$T(s) = \frac{s(s+3)(s+2)}{(s+1)(s+11)(s+2)(s+7)}$$

PROCEDURE:

- Type the program in MATLAB editor that is in M-file.
- Save and run the program.
- Give the required inputs in the command window of MATLAB in matrix format.
- 'step' function calculates the unit step response of a linear system.
- Zero initial state is assumed in state-space case.
- When invoked with no output arguments, this function plots the step response on the screen.
- step (sys) plots the response of an arbitrary LTI system.
- This model can be continuous or discrete, and SISO or MIMO.
- The step response of multi-input systems is the collection of step responses for each input channel.
- The duration of simulation is determined automatically based on the system poles and zeroes.
- Note down the response of the transfer function obtained in MATLAB.
- The response of the transfer function is also obtained theoretically.
- Both the responses are compared.

THEORETICAL CALCULATIONS:

GRAPH:



TABULAR FORM

T	C(T)
0	
1	
2	
3	
4	
5	
6	

RESULT: