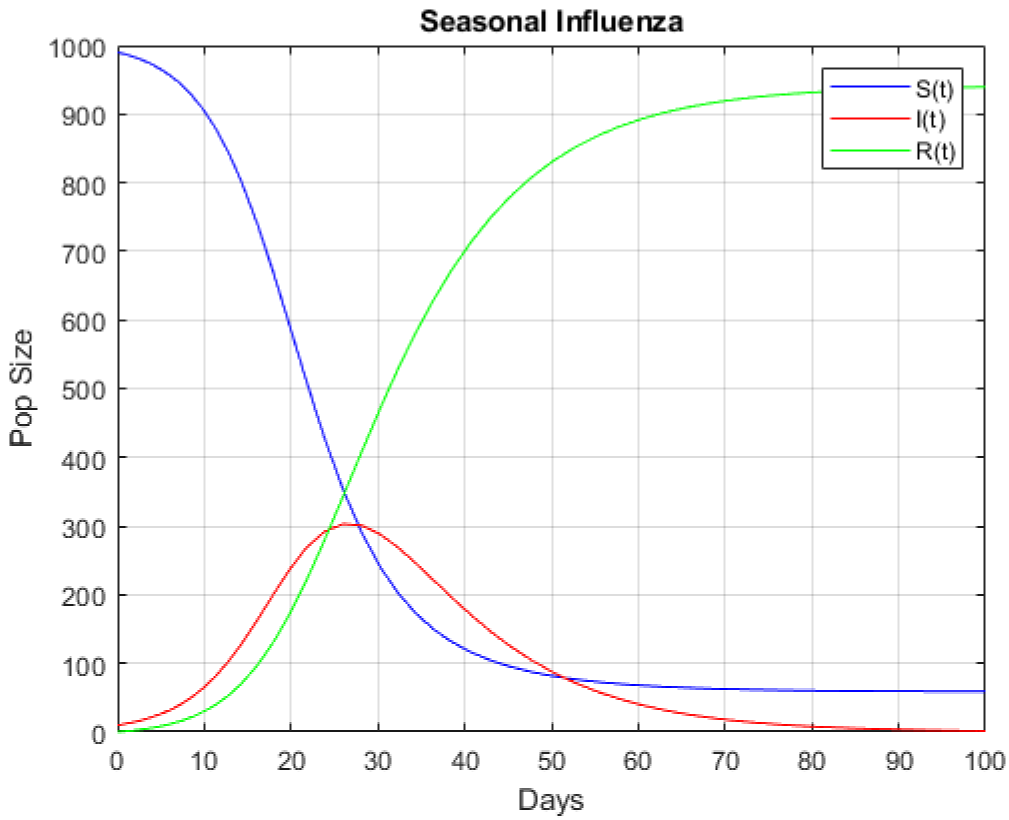
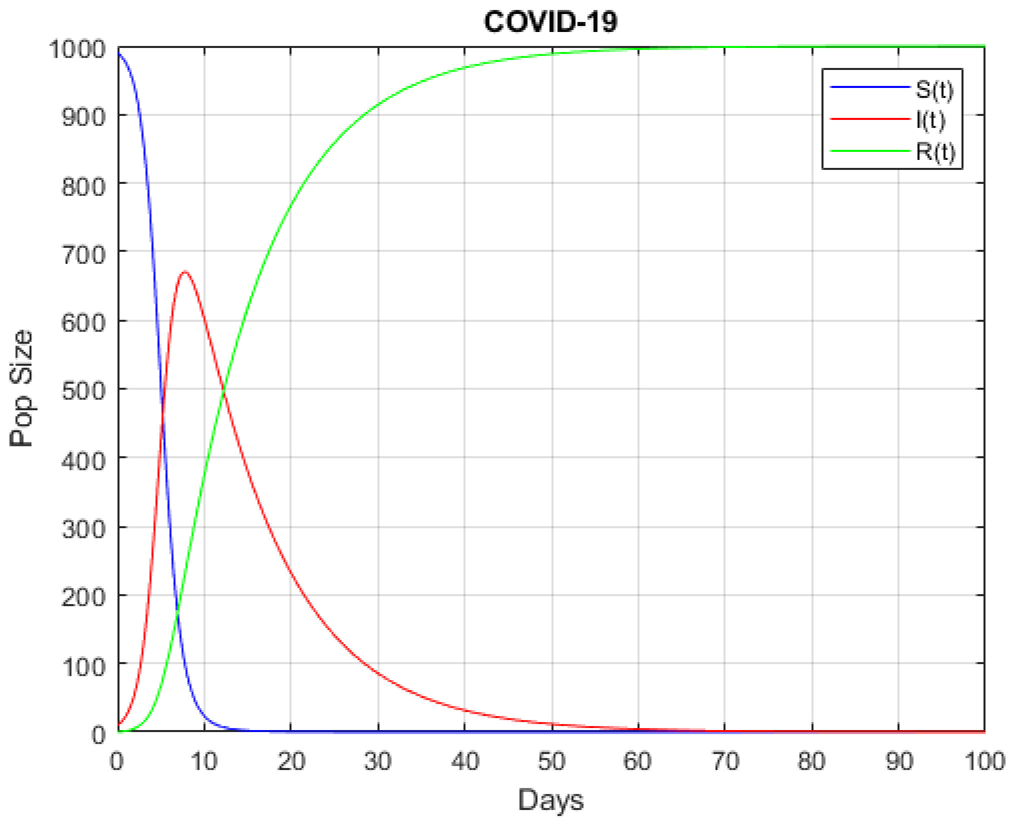
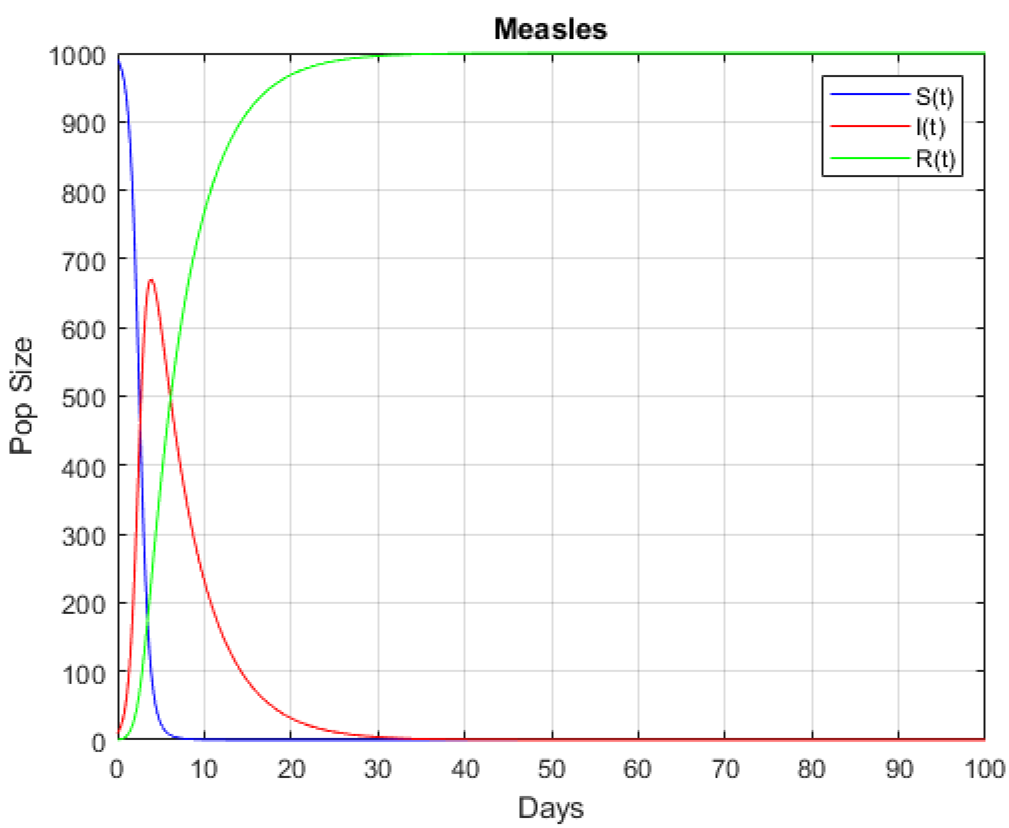
```
% MAE 384 PART 1 DISEASE SPREAD MODEL
clc;

% Disease parameters(beta, gamma)
disease_param = [
    .3, .1; % Influenza
    1.0, .1; % Covid-19
    2.0, .2; % Measles
];

% initial conditions
h = 1; % day step size

T = 100; % simulation time in days

time_span = [0 T]; %time vector for simulation

suscep_ind0 = 990; inf_ind0 = 10; rec_ind0 = 0; % initial pop size

% diff eqs

for k = 1:size(disease_param, 1)
    beta = disease_param(k, 1);  % transmission rate for each disease
    gamma = disease_param(k, 2); % recovery rate for current disease

    SIR_ODEs = @(t, y) [ %diff eq column vector for ode45 function
        -(beta / sum(y)) * y(1) * y(2);                    % dS/dt
         (beta / sum(y)) * y(1) * y(2) - gamma * y(2);     % dI/dt
         gamma * y(2)                                      % dR/dt
];


    y0 = [suscep_ind0; inf_ind0; rec_ind0]; %initial conditions for ode
solver

    % Solve the ODE system using ode45
    [t, y] = ode45(SIR_ODEs, time_span, y0); %ode solver for time span &
initial conditions, using runge-kutta methods

    % Extract results
    suscep_ind = y(:, 1);  % S(t)
    inf_ind = y(:, 2);     % I(t)
    rec_ind = y(:, 3);     % R(t)

    figure; %plotting SIR for each disease
    disease_names = {'Seasonal Influenza', 'COVID-19', 'Measles'}; %disease
name array for matching plots
    plot(t, suscep_ind, 'b', 'DisplayName', 'S(t)');
    hold on;
    plot(t, inf_ind, 'r', 'DisplayName', 'I(t)');
    plot(t, rec_ind, 'g', 'DisplayName', 'R(t)');
    title(disease_names{k});
```

```
    xlabel('Days');
    ylabel('Pop Size');
    legend;
    grid on;
end
```




COVID-19
Pop Size
Days
S(t)
I(t)
R(t)
1000
900
800
700
600
500
400
300
200
100
0
0
10
20
30
40
50
60
70
80
90
100


Measles
Pop Size
Days
S(t)
I(t)
R(t)
1000
900
800
700
600
500
400
300
200
100
0
0
10
20
30
40
50
60
70
80
90
100

Published with MATLAB® R2023b