1)

```
clear all;
clc;
% Initial Values
I0 = 10;
S0 = 990;
R0 = 0;

N = I0 + S0 + R0;

Beta = [.3 1 2];
gamma = [.1 .1 .2];
ti = ["Seasonal Influenza","COVID-19","Measles"];
leg = ["Recovered","Suseptible","Infected"];

h = 1;
t0 = 0; tf = 100;
tiledlayout(3,1);
RValsFinal = zeros(3,101);
SValsFinal = zeros(3,101);
IValsFinal = zeros(3,101);
% Change of Virus loop
for j = 1:length(Beta)
    Gamma=gamma(j);
    BN1=Beta(j)/1000;
    time = t0:h:tf;
    Rvals = zeros(size(time));
    Svals = zeros(size(time));
    Ivals = zeros(size(time));
    Nvals = zeros(size(time));

    Rvals(1) = R0;
    Svals(1) = S0;
    Ivals(1) = I0;
    Nvals(1) = 1000;
    dRdt = @(I) Gamma*I;
    dSdt = @(I,S) -BN1*S*I;
    dIdt = @(I,S) (BN1*S*I)-(Gamma*I);
    % Time loop
        for i = 1:length(time)-1
            R=Rvals(i);
            S=Svals(i);
            I=Ivals(i);

            rk1 = dRdt(I);           % Runge Kutta Recovered K1
            sk1 = dSdt(I,S);            % Runge Kutta Susceptible K1
            ik1 = dIdt(I,S);          % Runge Kutta Infected K1
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            ik2 = dIdt((I + ik1 * (h/2)) , S + sk1 * (h/2));           % Runge
Kutta Infected K2
            rk2 = dRdt(I + ik1 * (h/2));           % Runge Kutta Recovered K2
            sk2 = dSdt(I + ik1 * (h/2)  , (S + sk1 * (h/2)));           % Runge
Kutta Susceptible K2

            sk3 = dSdt(I + ik2 * (h/2) ,(S + sk2 * (h/2)));            % Runge
Kutta Susceptible K3
            ik3 = dIdt((I + ik2 * (h/2)) ,S + sk2 * (h/2));           % Runge Kutta
Infected K3
            rk3 = dRdt(I + ik2 * (h/2));           % Runge Kutta Recovered K3

            ik4 = dIdt((I + ik3 * h),S + sk3 * h);           % Runge Kutta Infected
K4
            sk4 = dSdt(I + ik3 * h , (S + sk3 * h));           % Runge Kutta
Susceptible K4
            rk4 = dRdt(I + ik3 * h);

            Rvals(i+1) = R + (1/6) * (rk1 + 2*(rk2) + 2*(rk3) + rk4) * h;
            Svals(i+1) = S + (1/6) * (sk1 + 2*(sk2) + 2*(sk3) + sk4) * h;
            Ivals(i+1) = I + (1/6) * (ik1 + 2*(ik2) + 2*(ik3) + ik4) * h;
            Nvals(i+1) = Rvals(i+1) + Svals(i+1) + Ivals(i+1);
            RValsFinal(j,i+1) = Rvals(i+1);
            SValsFinal(j,i+1) = Svals(i+1);
            IValsFinal(j,i+1) = Ivals(i+1);
        end
```

2)

```
    nexttile;
    plot(time,Rvals);
    hold on;
    plot(time,Svals);
    plot(time,Ivals);
    title(ti(j));
    legend(leg);
    hold off;

end
RValsFinal(:,1) = R0;
SValsFinal(:,1) = S0;
IValsFinal(:,1) = I0;

% Seasonal Influenza Data
    % Recovered Values = RValsFinal(1,:);
    % Suseptible Values = SValsFinal(1,:);
    % Infected Values = IValsFinal(1,:);

% COVID-19 Data
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    % Recovered Values = RValsFinal(2,:);
    % Suseptible Values = SValsFinal(2,:);
    % Infected Values = IValsFinal(2,:);

% Measles Data
    % Recovered Values = RValsFinal(3,:);
    % Suseptible Values = SValsFinal(3,:);
    % Infected Values = IValsFinal(3,:);
```

3)

The Plots for the Recovered and Suseptible data for each virus resemble hyperbolic tangent functions while the Plots for Infected resemble a hyperbolic secant function.

The gamma value affects the magnitude of the rate of change of recovered people. As gamma increases, so does the magnitude of the rate of those recovered. Likewise, as Beta increases, the magnitude of the rate of change of suseptible people also increases. This, in turn, causes the rate of which people are infected to spike. Therefore, the order of contagiousness of the viruses is:

Measles - Most infectious -> COVID-19 -> Seasonal Influenza - Least infectious.