**Code for wireless communication lab-4204**

1. Write a MATLAB code for calculating **received signal strength.**% Received Signal Strength (RSS) Calculation using Free Space Path Loss

clc; clear;

% Parameters

Pt = 30; % Transmit power in dBm

f = 900; % Frequency in MHz

d = 500; % Distance in meters (example: 500 meters)

% Convert distance to km for FSPL

d\_km = d / 1000;

% Free Space Path Loss (FSPL) in dB

PL\_dB = 20\*log10(d\_km) + 20\*log10(f) + 32.44;

% Received Signal Strength (in dBm)

Pr\_dBm = Pt - PL\_dB;

% Display result

fprintf('At %.0f meters, Received Signal Strength = %.2f dBm\n', d, Pr\_dBm);

2. Write a MATLAB code for **Frequency Modulation**t=0:0.001:1;

fm=3; % modulating signal

fc=50; %carrier signal

b=10; % frequency deviation

x=sin(2\*pi\*fm\*t); % modulating signal

y=cos(2\*pi\*fc\*t); %carrier signal

z=(cos((2\*pi\*fc\*t)+(b\*x)));

%% Message signal plot

subplot(4, 1, 1);

plot(t, x);

xlabel('time(sec)')

ylabel('Amplitude(V)')

title('MODULATING SIGNAL')

%% Carrier signal plot

subplot(4, 1, 2);

plot(t,y);

xlabel('time(sec)')

ylabel('Amplitude(V)')

title('CARRIER SIGNAL')

%% Modulated signal plot

subplot(4, 1, 3);

plot(t, z);

xlabel('time(sec)')

ylabel('Amplitude(V)')

title('FREQUENCY MODULATED SIGNAL')  
  
  
3. Write MATLAB code to calculate the **Grade of Service** during the Busy Hour.  
  
% Example 2.1: To get GoS during Busy Hour

clc;

clear all;

% Given values

LC = 10; % Lost calls

CC = 380; % Carried calls

% Total offered calls

OC = LC + CC;

% Grade of Service (GoS) = (Number of Lost Calls) / (Total Number of Offered Calls)

GoS = LC / OC;

% Display result

fprintf('The GoS during busy hour is %.4f\n', GoS);

4. Write a MATLAB code for **Okumura model** for calculating Median path loss.

clc;

clear all;

close all;

Lfs1 = input('enter the free space loss: ');

Amu = input('enter the median attenuation value: ');

Hmg = input('enter the Mobile station antenna height gain factor: ');

Hbg = input('enter the Base station antenna height gain factor: ');

Kc = input('enter the Correction factor gain: ');

L = Lfs1 + Amu - Hmg - Hbg - Kc; % calculating median path loss

disp(sprintf('%s %f %s', 'the median path loss:', L, 'dB'));

5.Write MATLAB code to calculate **the number of Mobile Subscribers Supported**

clc;

clear all;

channels = 50; % Number of available channels

blocking = 0.02; % Blocking probability (2%)

HT = 120; % Average holding time in seconds (2 minutes)

BHcall = 1.2; % Average number of calls per user per hour

% From Erlang B table (for 50 channels and 2% blocking),

% the offered traffic load (A) is 40.26 Erlangs

A = 40.26;

% Carried traffic load = Offered traffic \* (1 - blocking)

B = A \* (1 - blocking);

% Average traffic per user (in Erlangs):

% = calls per user per hour \* average holding time in hours

Avgtraffic\_user = BHcall \* HT / 3600;

% Number of users supported:

No\_users = B / Avgtraffic\_user;

% Print the result (rounded)

fprintf('NO of mobile subscribers supported are %d\n', round(No\_users));

6. Write a MATLAB code for **Hata Model** For predicting radio wave propagation in urban and suburban environments.

clc;

clear all;

close all;

% Predefined parameters

f = 900; % frequency in MHz

d = 5; % distance in km

hb = 50; % base station antenna height in meters

hm = 1.5; % mobile station antenna height in meters

% Correction factor for mobile antenna height (for urban large city, f ≥ 300 MHz)

if f >= 300

a\_hm = 3.2\*(log10(11.75\*hm))^2 - 4.97;

else

a\_hm = 8.29\*(log10(1.54\*hm))^2 - 1.1;

end

% Urban path loss calculation

L\_urban = 69.55 + 26.16\*log10(f) - 13.82\*log10(hb) + (44.9 - 6.55\*log10(hb)) \* log10(d) - a\_hm;

% Suburban path loss calculation

L\_suburban = L\_urban - 2\*(log10(f/28))^2 - 5.4;

% Display results

fprintf('Median Path Loss in Urban Environment: %.2f dB\n', L\_urban);

fprintf('Median Path Loss in Suburban Environment: %.2f dB\n', L\_suburban);  
  
  
7.Write MATLAB code to calculate the **average busy hour call attempts**clc;

clear all;

close all;

% Input total number of call attempts in a day

total\_call\_attempts = input('Enter total number of call attempts in a day: ');

% Input number of busy hours in a day (typically 1 or 2 hours)

busy\_hours = input('Enter number of busy hours in a day: ');

% Calculate average BHCA

average\_BHCA = total\_call\_attempts / busy\_hours;

% Display the result

fprintf('Average Busy Hour Call Attempts (BHCA) = %.2f calls\n', average\_BHCA);

8. Write a MATLAB code for calculating **signal attenuation(path loss**) over distance using **Long Distance path loss Model.**

clc; clear;

% Parameters

fc = 2.4e9; % Carrier frequency in Hz (2.4 GHz)

d0 = 1; % Reference distance in meters

n = 3; % Path loss exponent

Pt = 20; % Transmit power in dBm

% Distance range (in meters)

d = 1:0.5:100; % From 1m to 100m

% Wavelength (in meters)

lambda = 3e8 / fc;

% Free-space Path Loss at reference distance d0

PL\_d0 = 20\*log10(4\*pi\*d0/lambda);

% Path Loss at distance d using log-distance model

PL\_d = PL\_d0 + 10 \* n \* log10(d/d0);

% Received Power at distance d

Pr\_d = Pt - PL\_d;

% Print only PL\_d and Pr\_d vectors

disp('Path Loss (dB):');

disp(PL\_d);

disp('Received Power (dBm):');

disp(Pr\_d);

9. Write a MATLAB code for **Amplitude Modulation**clear all;

close all;

clc;

% AM Wave

t=0:.0001:.1;

a=2;

fm=50;

fc=1000;

m=0.9;

m1=sin(2\*pi\*fm\*t);

c1=sin(2\*pi\*fc\*t);

am=a\*(1+m\*m1).\*c1;

figure

% Message Signal

subplot(3,1,1)

plot(t,m1);

xlabel('time')

ylabel('m1');

title('Information signal');

% Carrier Signal

subplot(3,1,2)

plot(t,c1);

xlabel('time')

ylabel('c1');

title('Carrier Signal');

% AM Wave

subplot(3,1,3)

plot(t,am);

xlabel('time')

ylabel('AM');