ADVANCED COMMUNICATION LAB

VII SEMESTER

SUBJECT CODE : 15ECL76

PART – B : SIMULATION EXPERIMENTS

Simulation Software : Simulink

CONTENTS:

1. Simulate NRZ, RZ, Half-sinusoidal and raised cosine pulses and generate eye diagram for binary polar signalling.

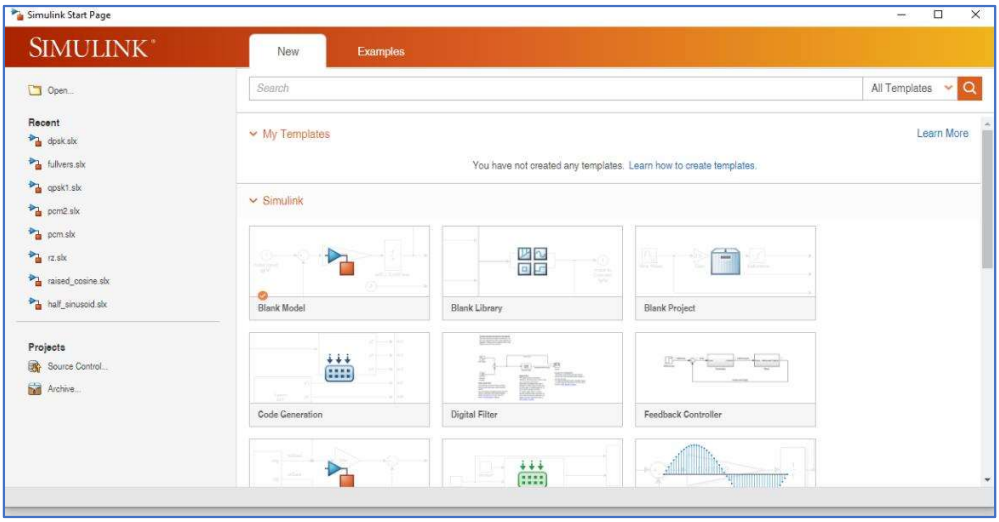
2. Simulate the pulse code modulation and demodulation system and display the waveforms.

3. Simulate the QPSK transmitter and receiver. Plot the signals and its constellation diagram.

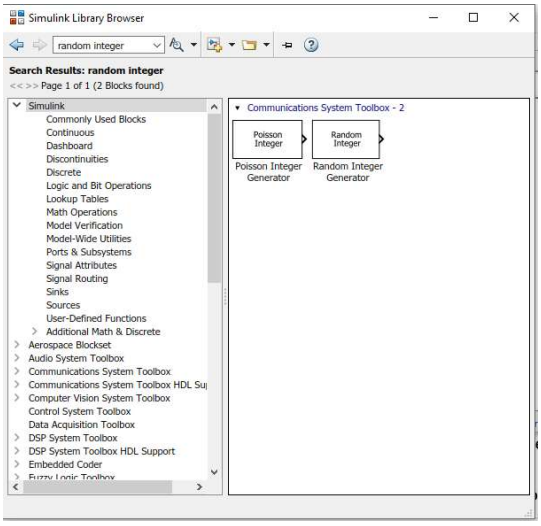
4. Test the performance of binary differential phase shift keying system by simulating the non-coherent detection of binary DPSK.

GENERAL PROCEDURE:

i. Open Simulink. Select Blank Model.



ii. In the Model Page, Go to Library Browser  . Type in the name of the block required in the search field. Drag and drop the block the Model page.



iii. Once all the blocks have been placed , rig up the connections by drawing wires. To do so just click on the open ends of each block and drag the wire to the required block.

iv. To change the properties of any block, double click on the block to get the parameters window.

v. Save the design by going to File → Save.

vi. Go to Simulation → Run or Click on the 'Play' button. (Shortcut: CTRL + T).

vii. Double click on the CROs or Constellation Diagrams to view the waveforms.

viii. The properties of CROs or Constellation diagrams can be altered in the 'Settings' option after opening them.

ix. To view the proper number of waveforms on the CRO, go to View → Layout and adjust accordingly.

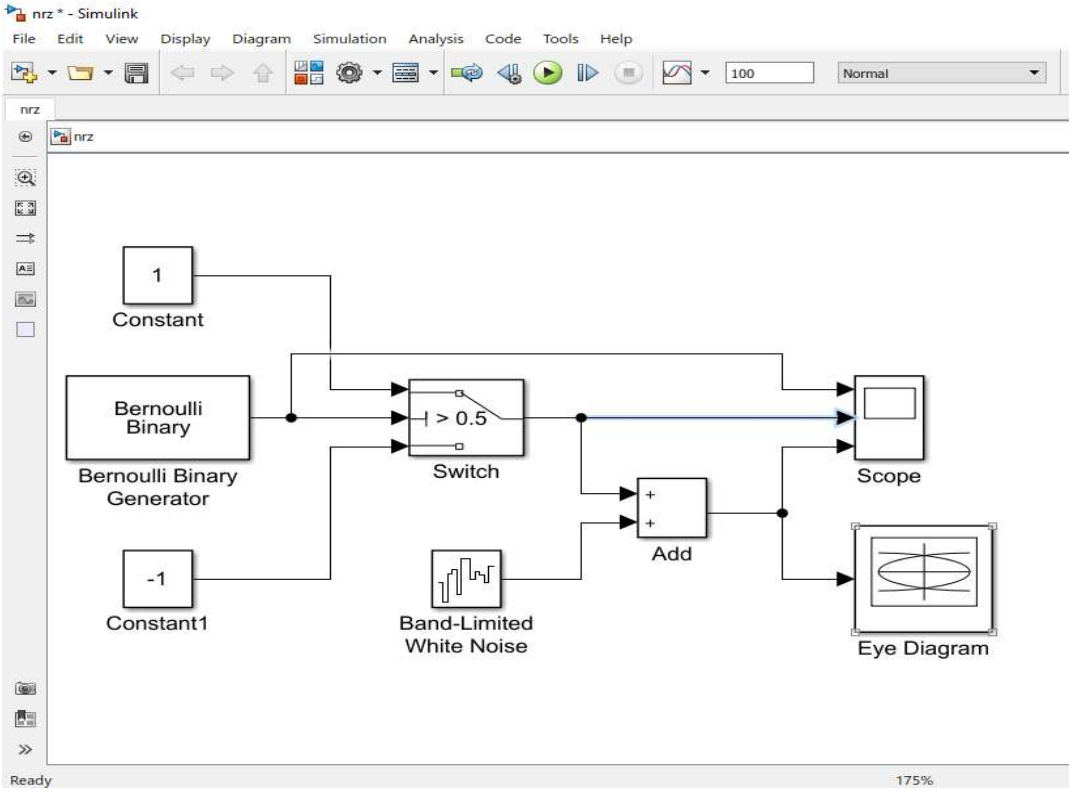
x. Note that some waveforms in this manual can be different from the obtained, due to random number sequences used.

EXPERIMENT 1:

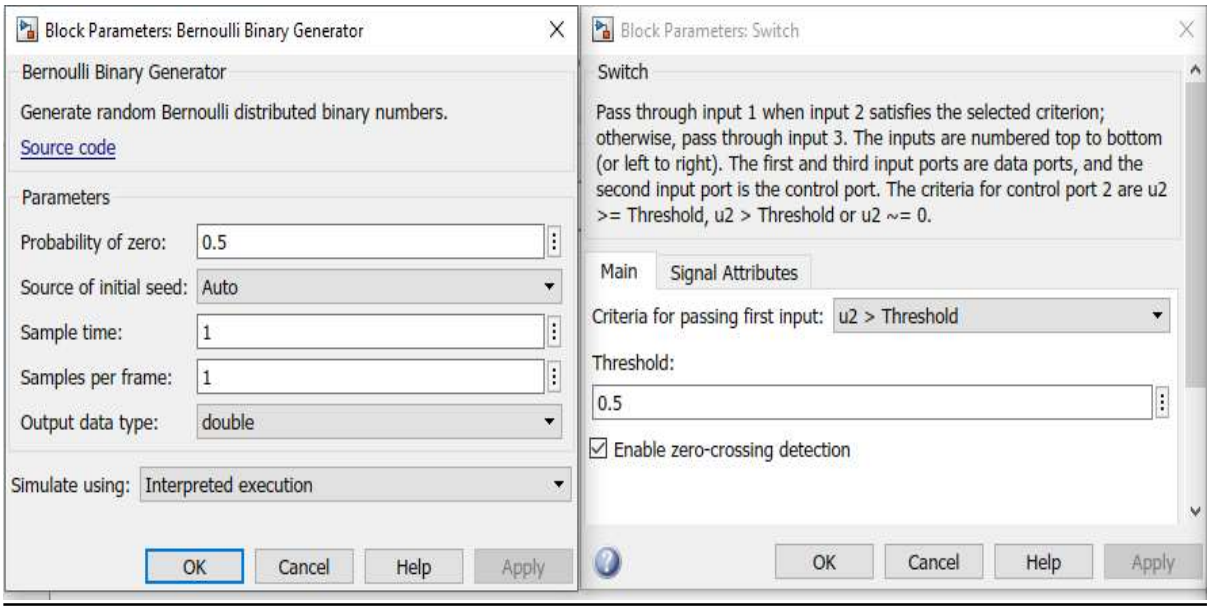
Simulate NRZ, RZ, Half-sinusoidal and raised cosine pulses and generate eye diagram for binary polar signalling.

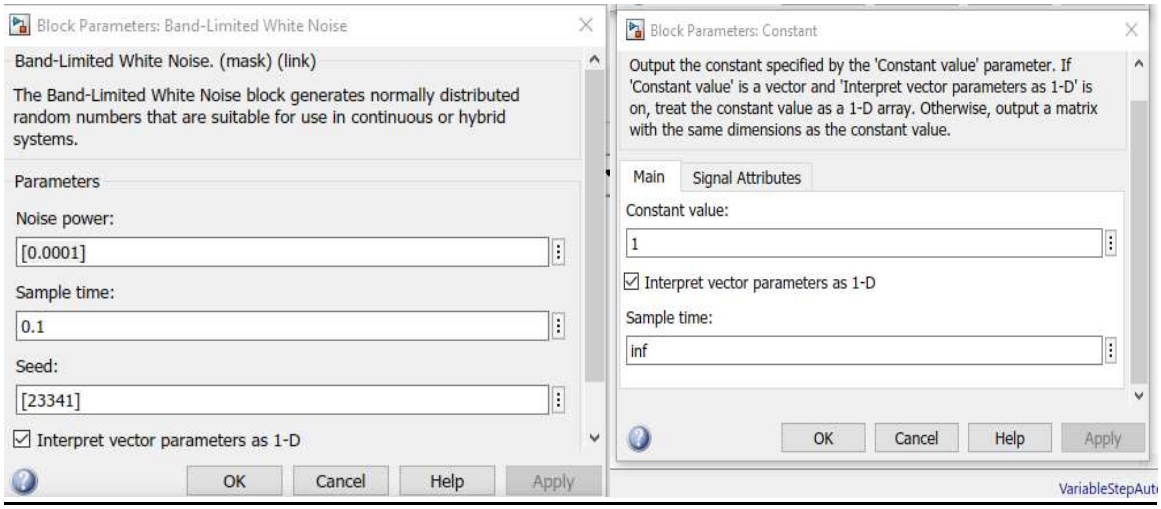
a. NRZ signalling (with Eye diagram for bipolar signalling):

CIRCUIT DIAGRAM:

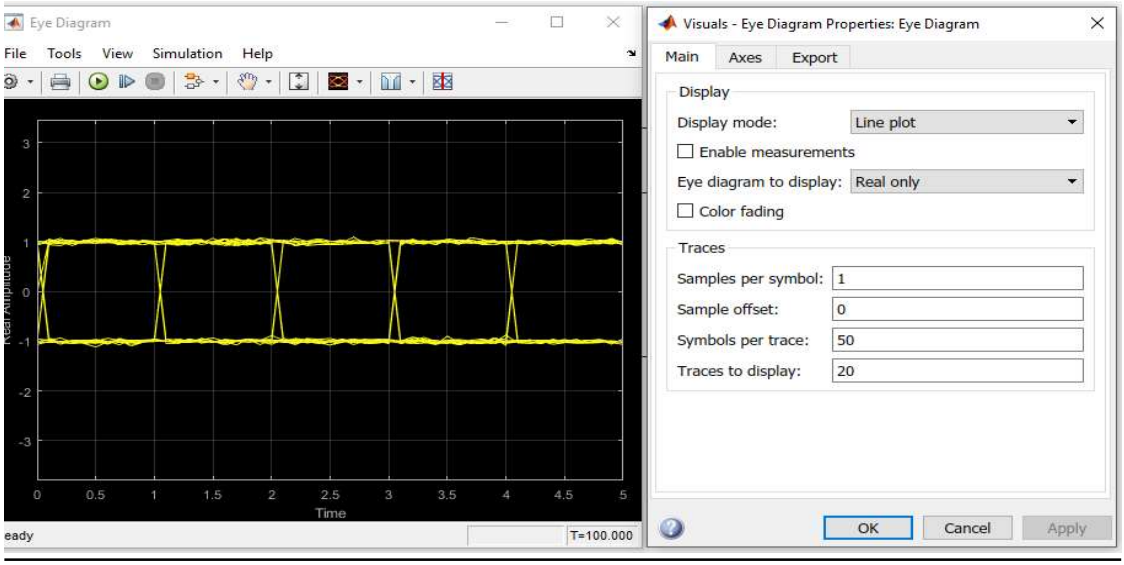


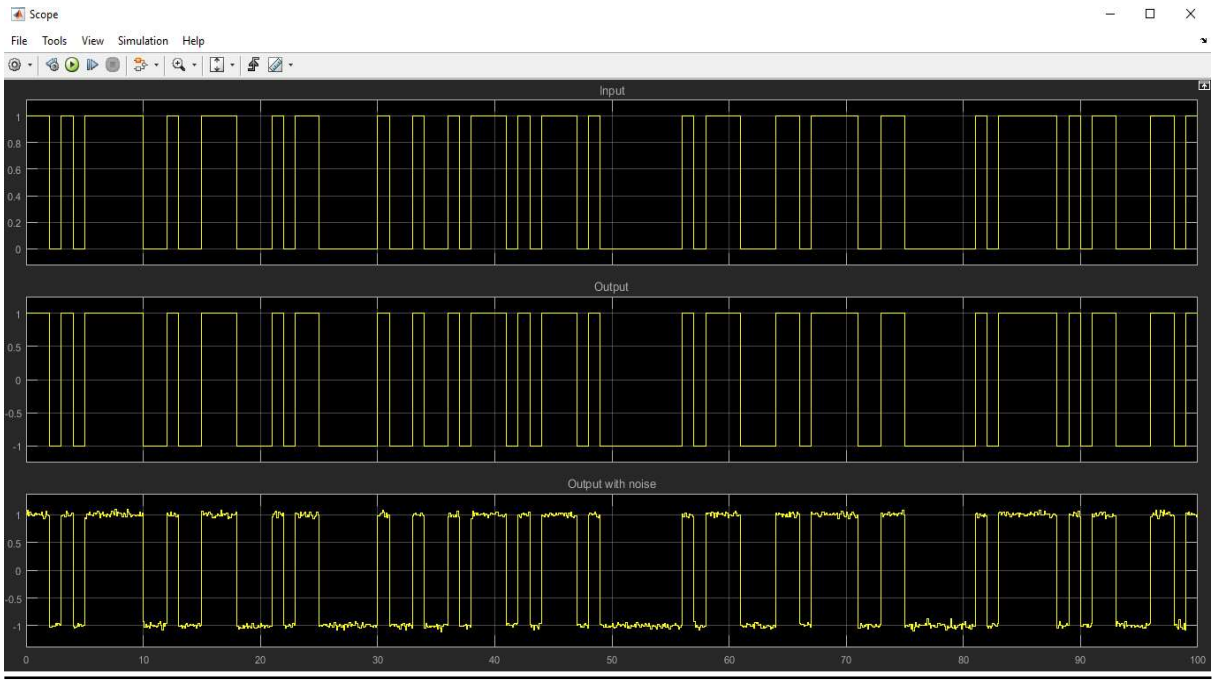
PARAMETERS:




Block Parameters: Band-Limited White Noise
Band-Limited White Noise. (mask) (link)
The Band-Limited White Noise block generates normally distributed random numbers that are suitable for use in continuous or hybrid systems.
Parameters
Noise power:
[0.0001]
Sample time:
0.1
Seed:
[23341]
Interpret vector parameters as 1-D
OK
Cancel
Help
Apply
Block Parameters: Constant
Output the constant specified by the 'Constant value' parameter. If 'Constant value' is a vector and 'Interpret vector parameters as 1-D' is on, treat the constant value as a 1-D array. Otherwise, output a matrix with the same dimensions as the constant value.
Main
Signal Attributes
Constant value:
1
Interpret vector parameters as 1-D
Sample time:
inf
OK
Cancel
Help
Apply

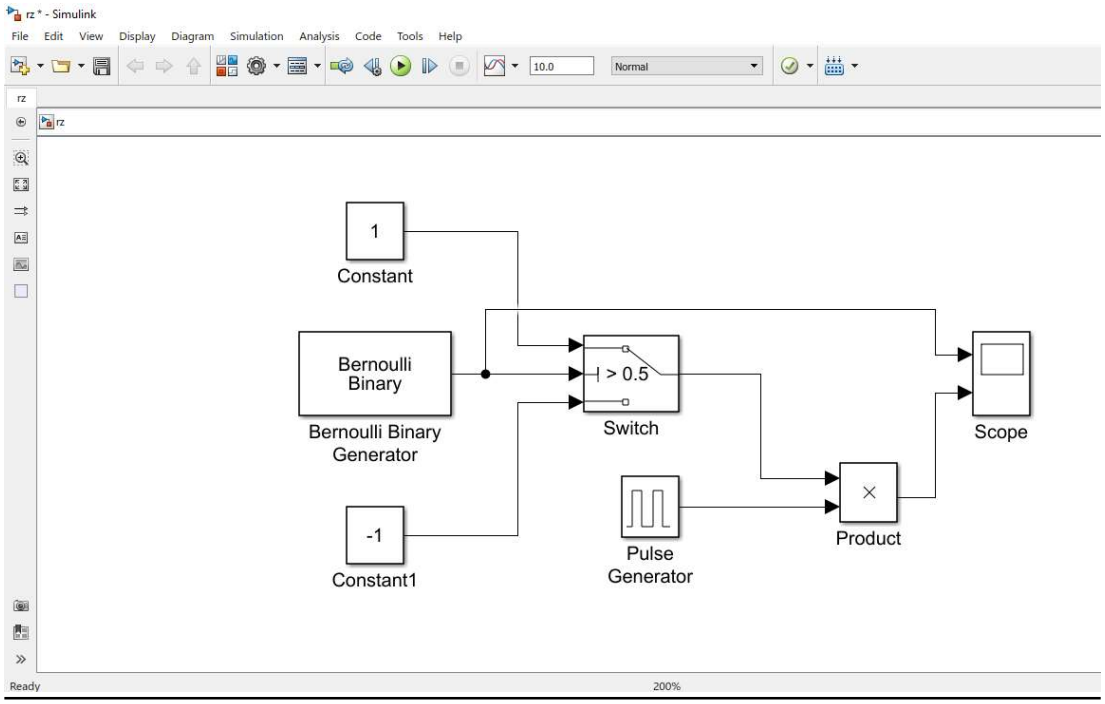
OUTPUTS:


Eye Diagram
File Tools View Simulation Help
Time
Visuals - Eye Diagram Properties: Eye Diagram
Main
Axes
Export
Display
Display mode:
Line plot
Enable measurements
Eye diagram to display:
Real only
Color fading
Traces
Samples per symbol:
1
Sample offset:
0
Symbols per trace:
50
Traces to display:
20
OK
Cancel
Apply
T=100.000

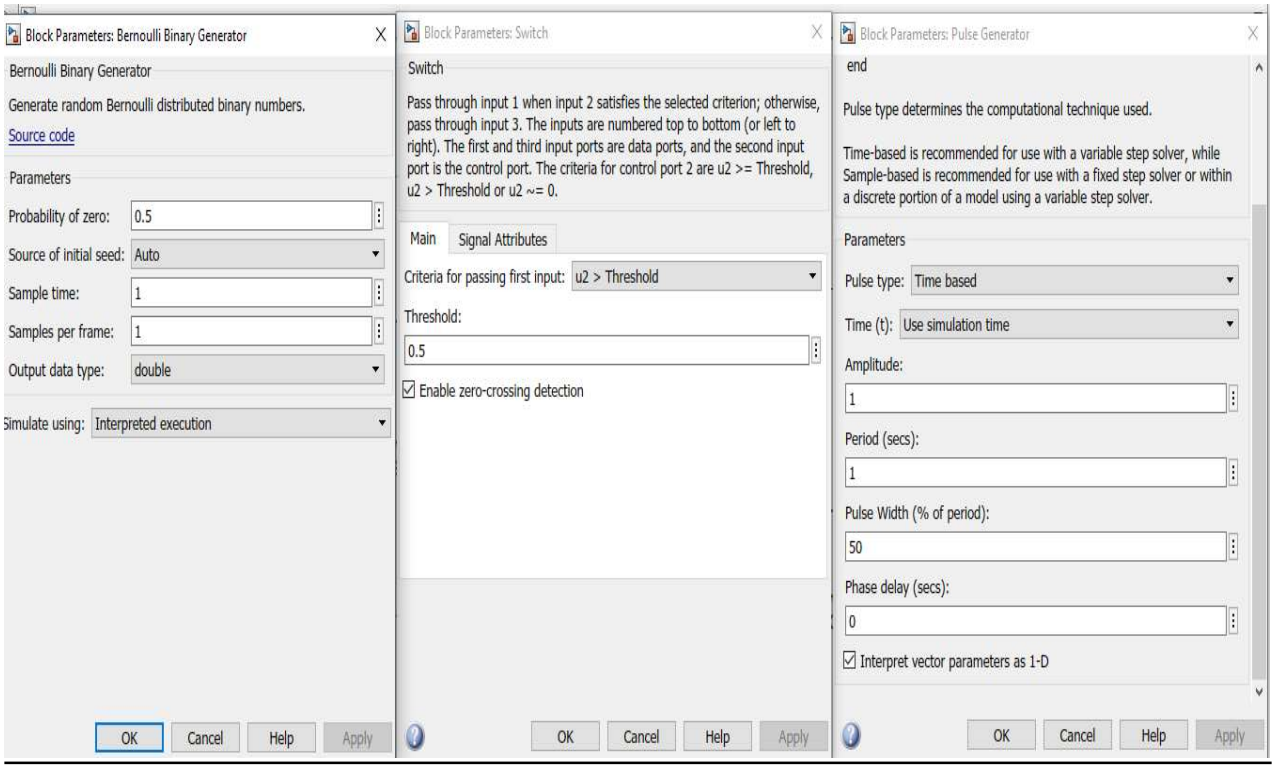

Scope
File Tools View Simulation Help
Input
Output
Output with noise

b. RZ Signalling:

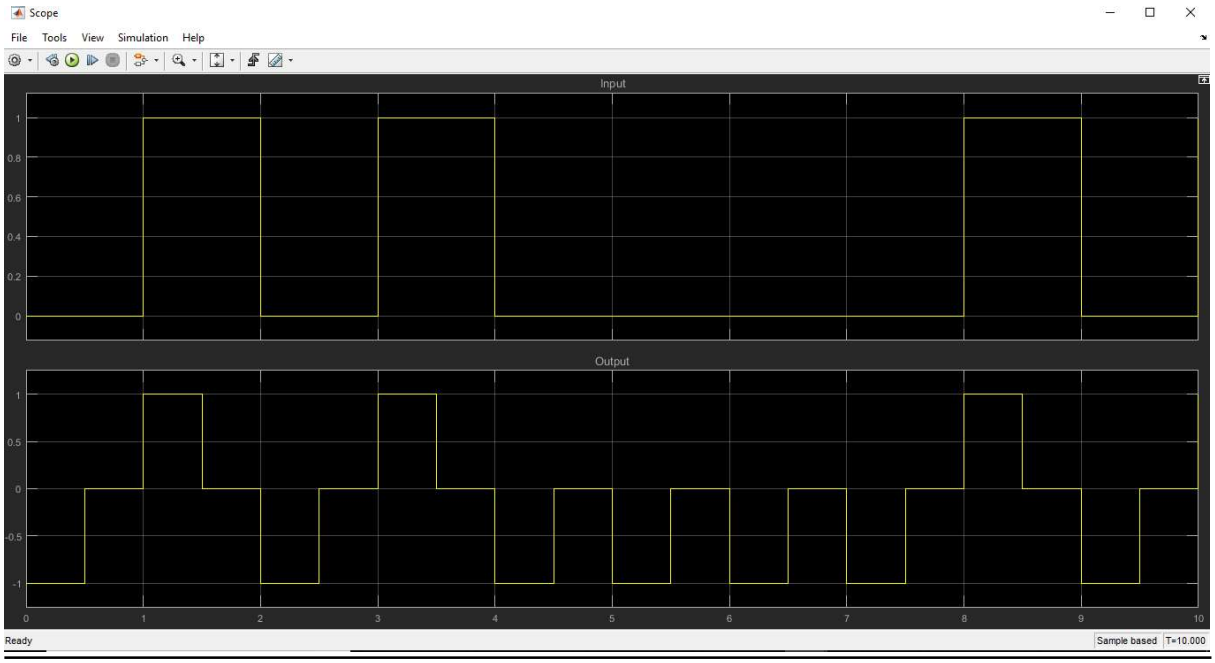
CIRCUIT DIAGRAM:



PARAMETERS:

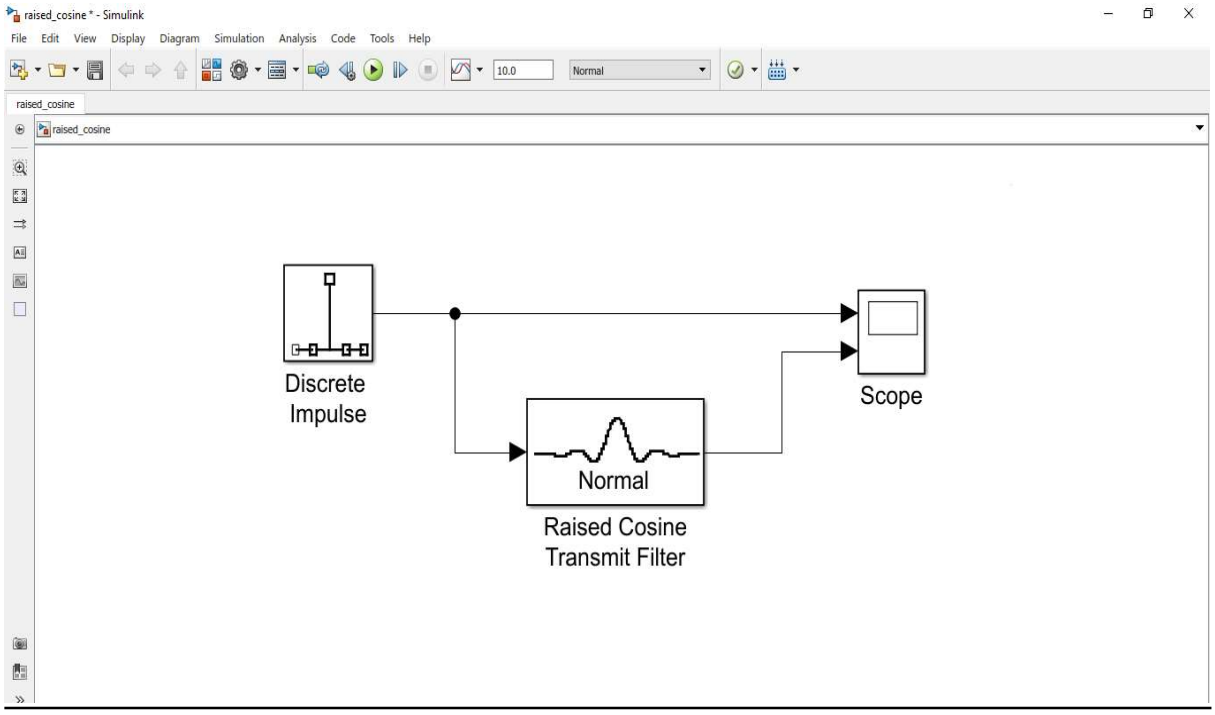


OUTPUT:

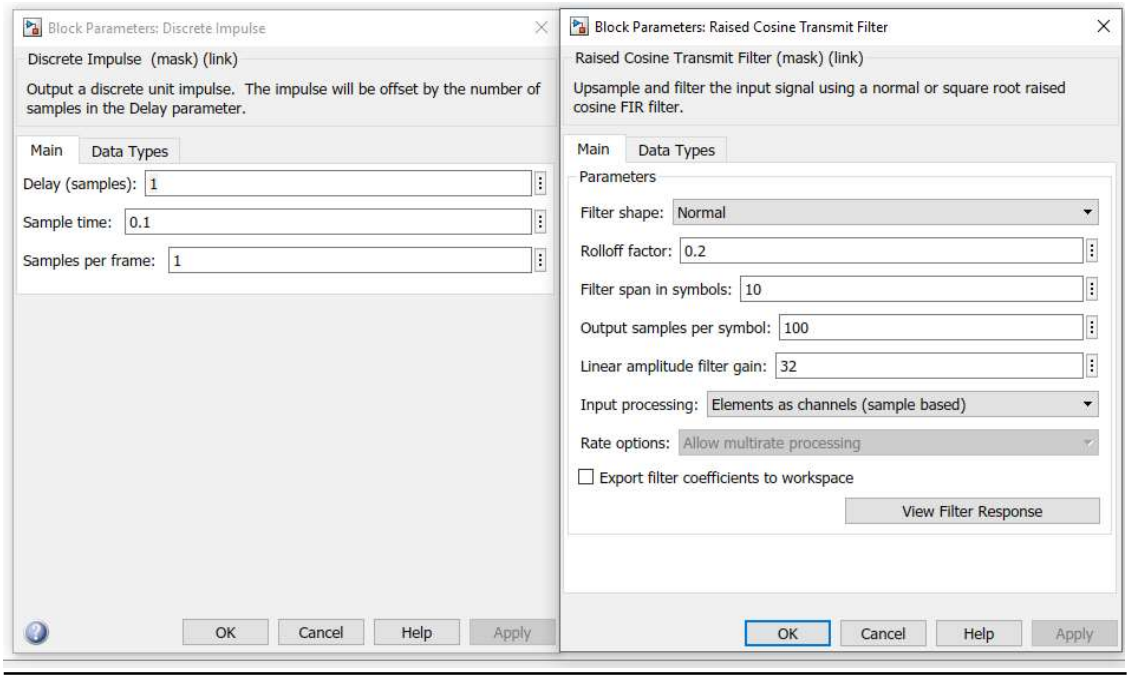


c. Raised Cosine Pulse:

CIRCUIT:



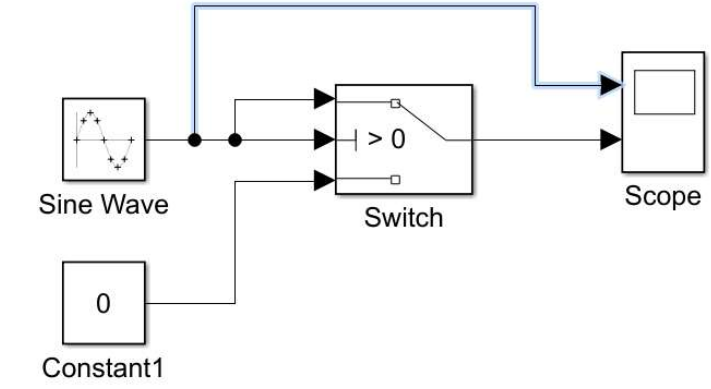
PARAMETERS:



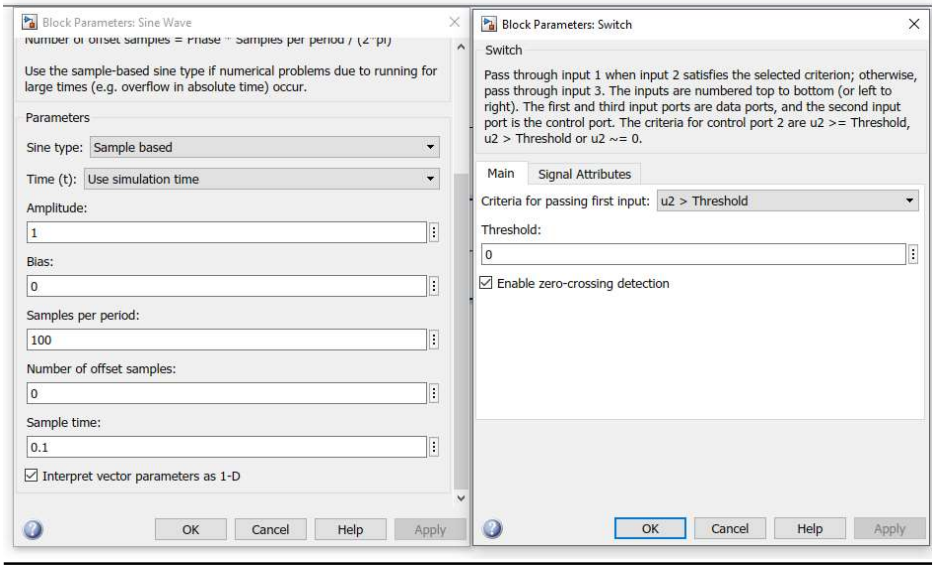
OUTPUT:

d. Half Sinusoid:

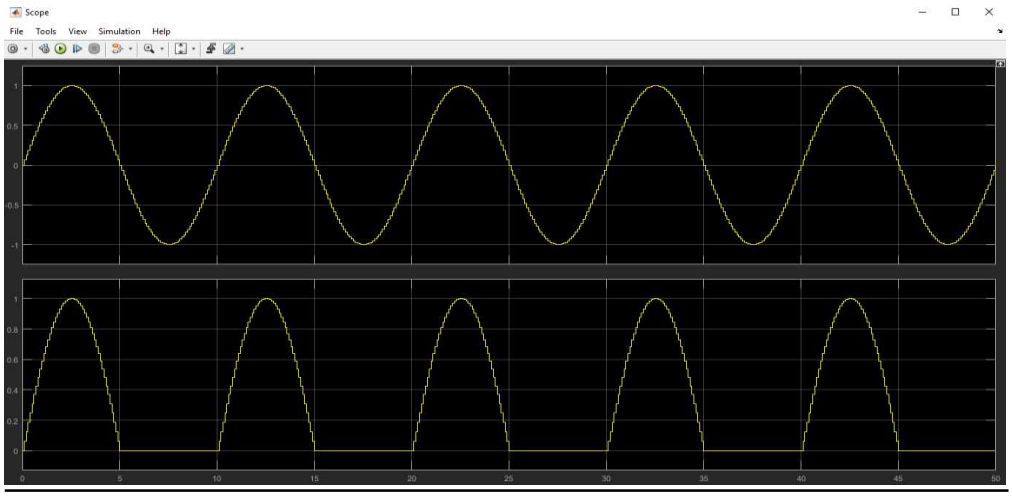
CIRCUIT:



PARAMETERS:

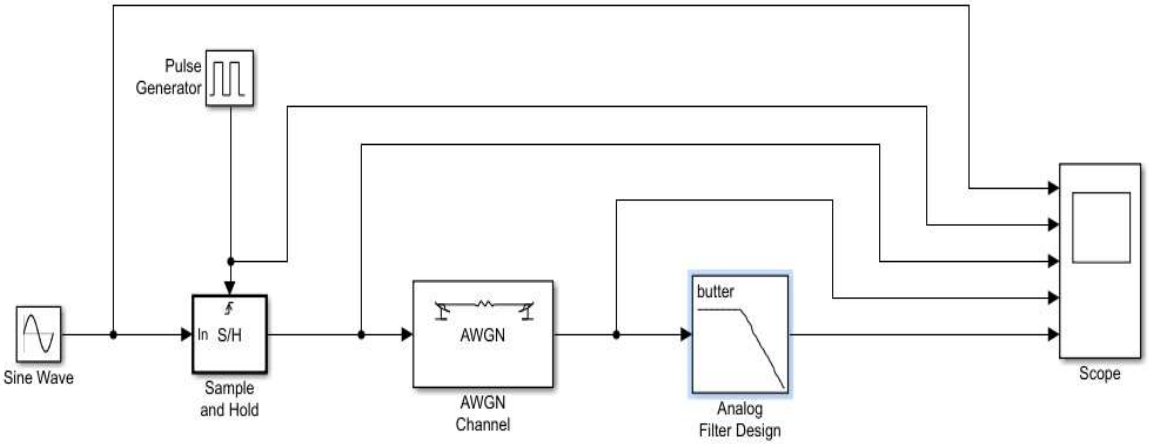


OUTPUT:

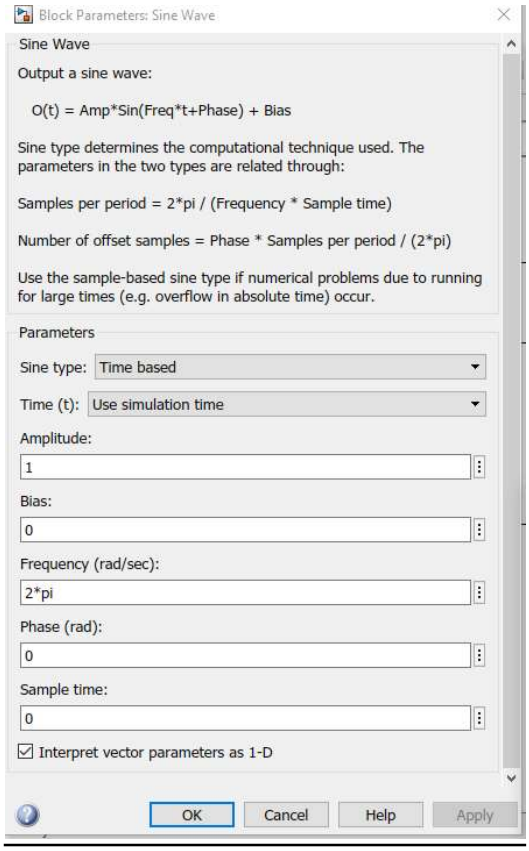


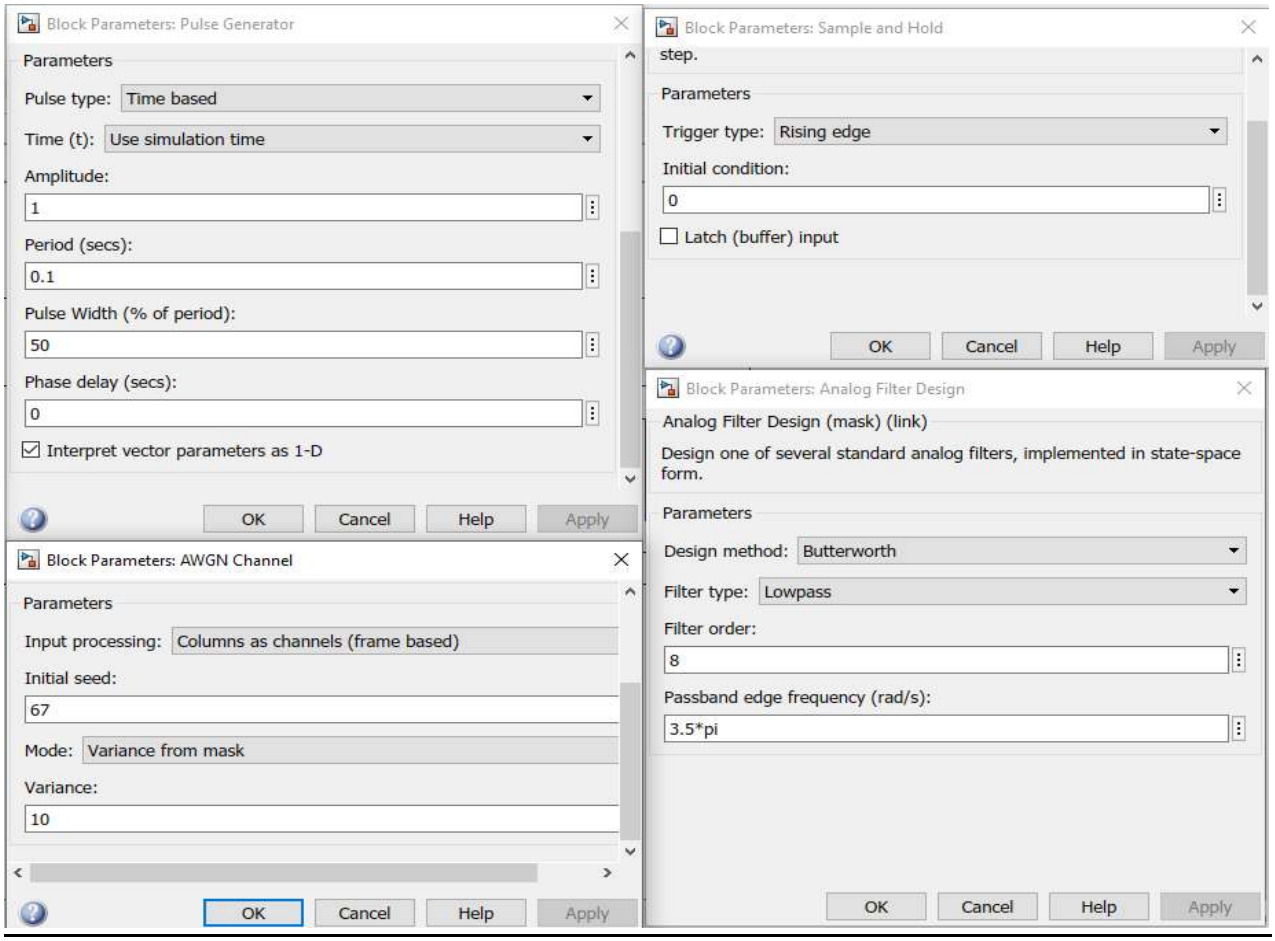
Experiment 2: Simulate the pulse code modulation and demodulation system and display the waveforms.

CIRCUIT:

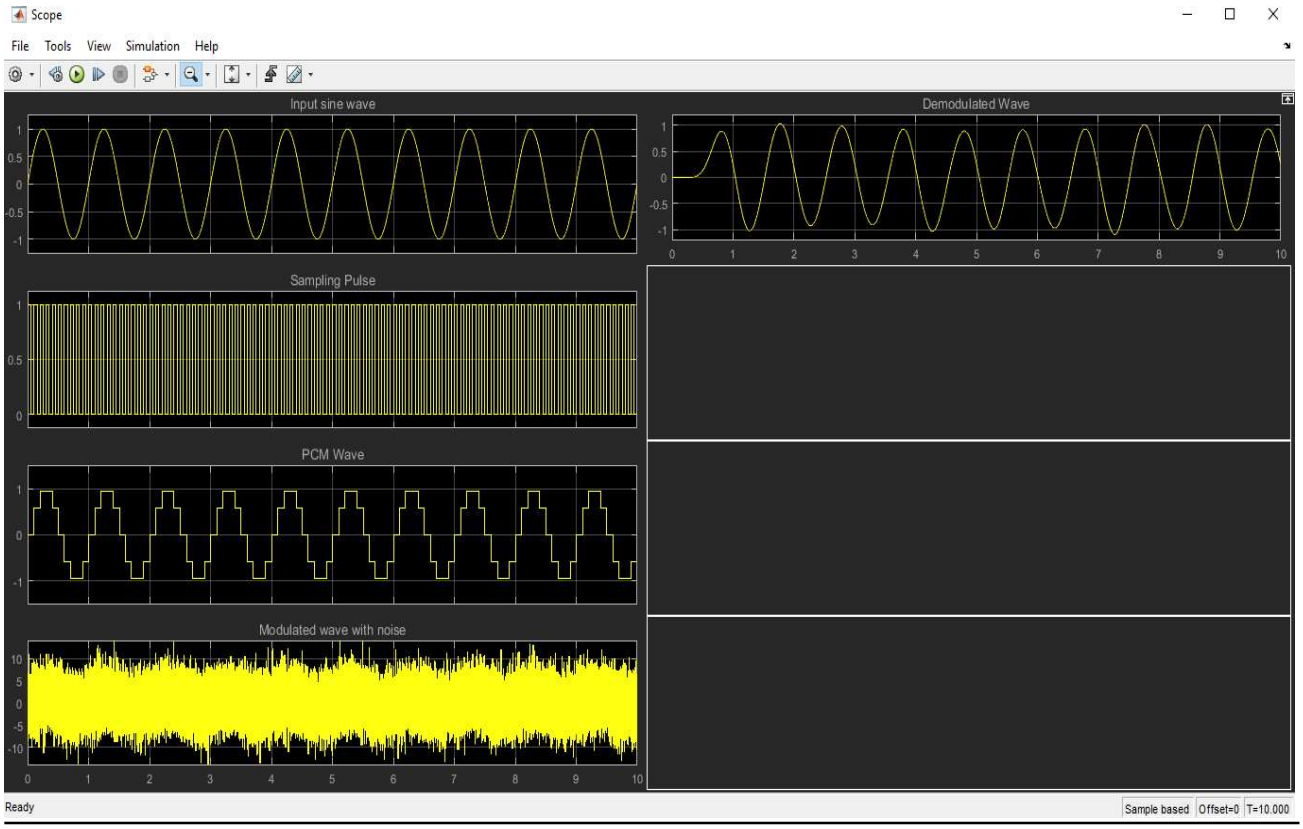


PARAMETERS:



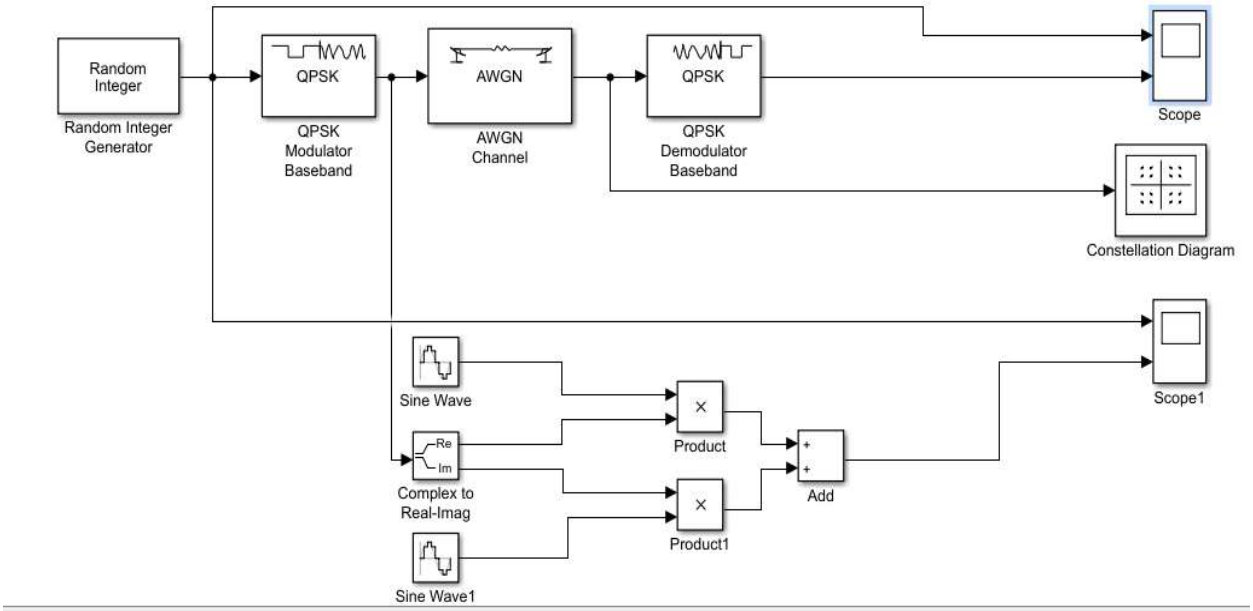

Block Parameters: Pulse Generator
Parameters
Pulse type: Time based
Time (t): Use simulation time
Amplitude:
1
Period (secs):
0.1
Pulse Width (% of period):
50
Phase delay (secs):
0
Interpret vector parameters as 1-D
OK
Cancel
Help
Apply
Block Parameters: Sample and Hold
step.
Parameters
Trigger type: Rising edge
Initial condition:
0
Latch (buffer) input
OK
Cancel
Help
Apply
Block Parameters: Analog Filter Design
Analog Filter Design (mask) (link)
Design one of several standard analog filters, implemented in state-space form.
Parameters
Design method: Butterworth
Filter type: Lowpass
Filter order:
8
Passband edge frequency (rad/s):
3.5*pi
OK
Cancel
Help
Apply
Block Parameters: AWGN Channel
Parameters
Input processing: Columns as channels (frame based)
Initial seed:
67
Mode: Variance from mask
Variance:
10
OK
Cancel
Help
Apply

OUTPUT:

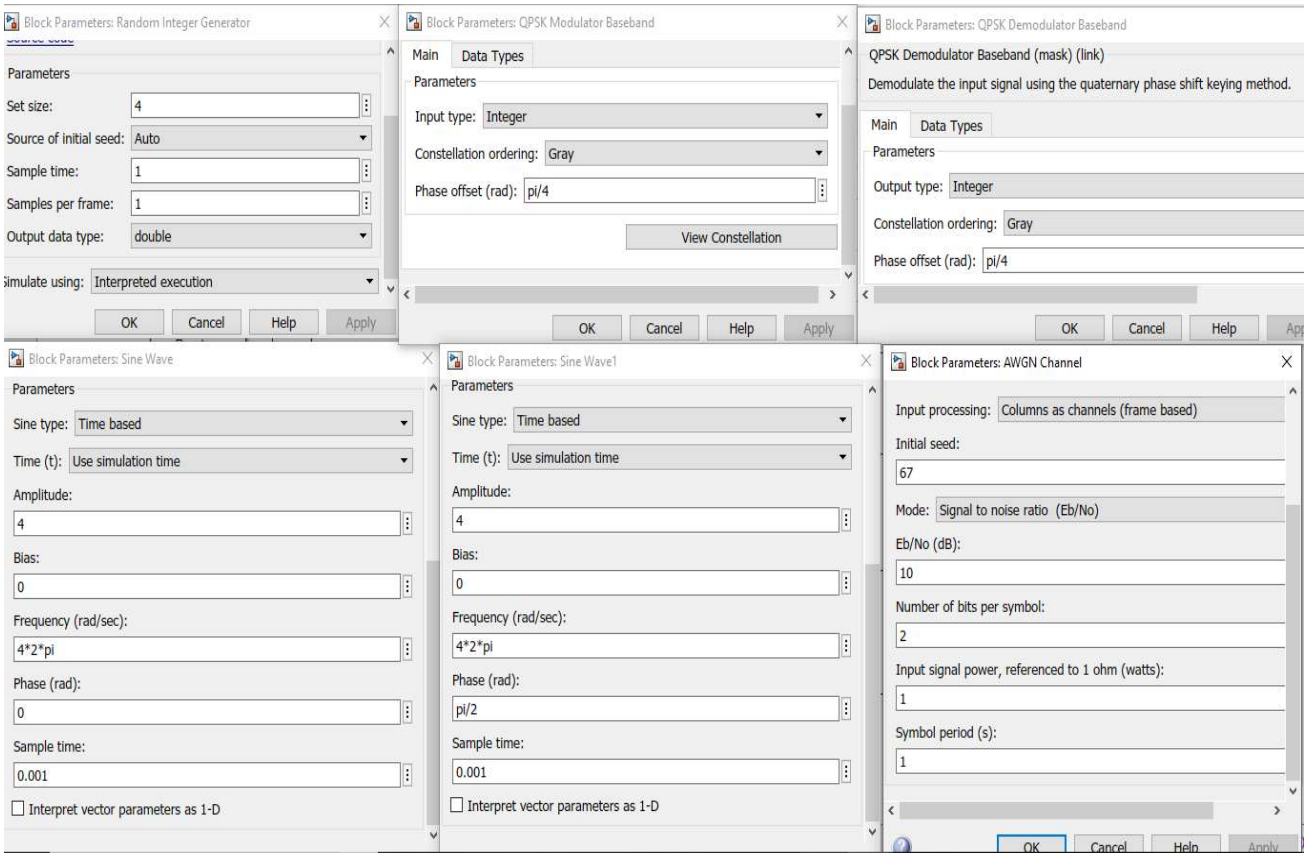

Scope
File Tools View Simulation Help
Input sine wave
Demodulated Wave
Sampling Pulse
PCM Wave
Modulated wave with noise
Ready
Sample based
Offset=0
T=10.000

Experiment 3: Simulate the QPSK transmitter and receiver. Plot the signals and its constellation diagram.

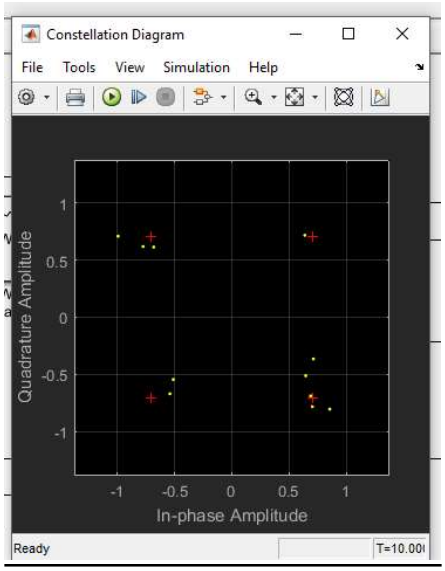
CIRCUIT:

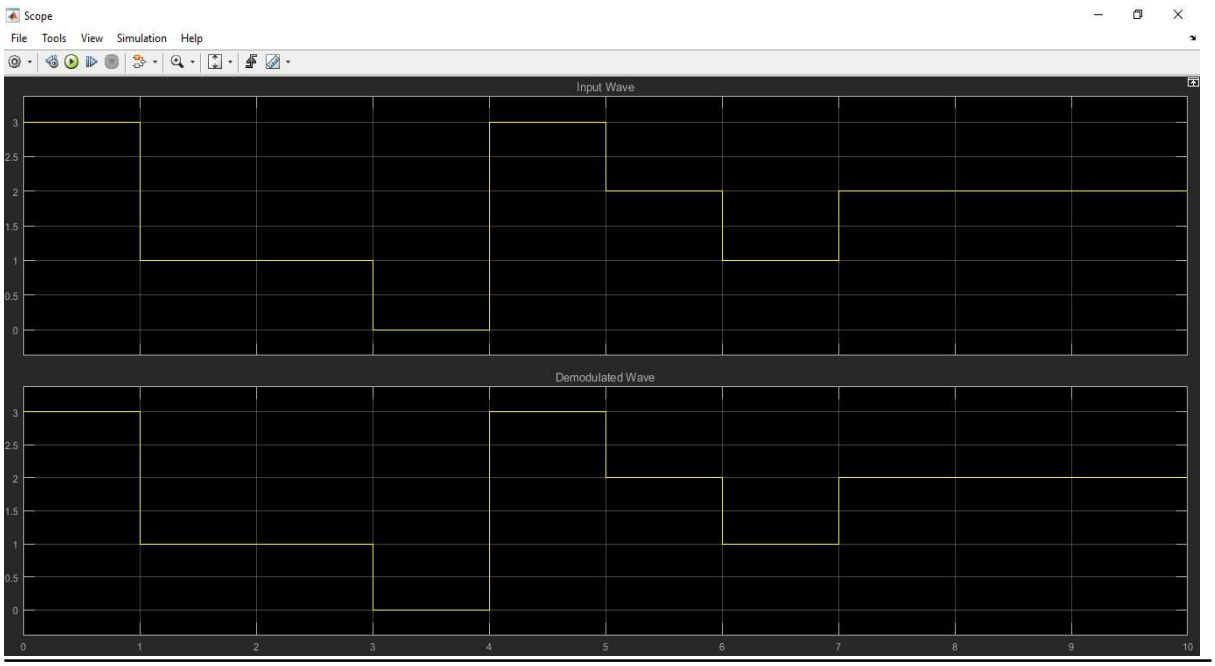


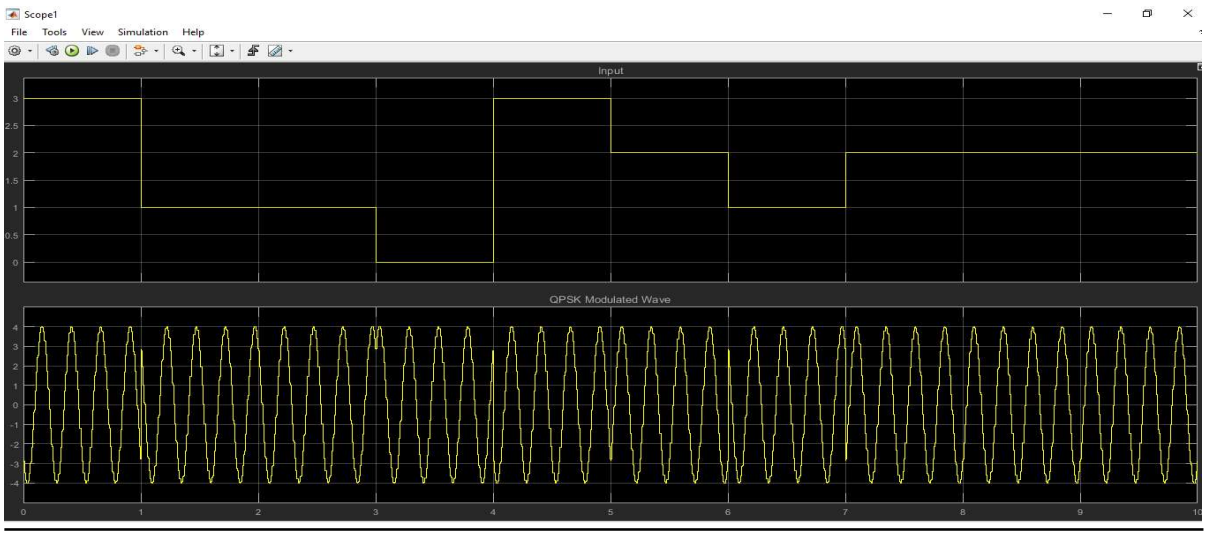
PARAMETERS:



OUTPUTS:

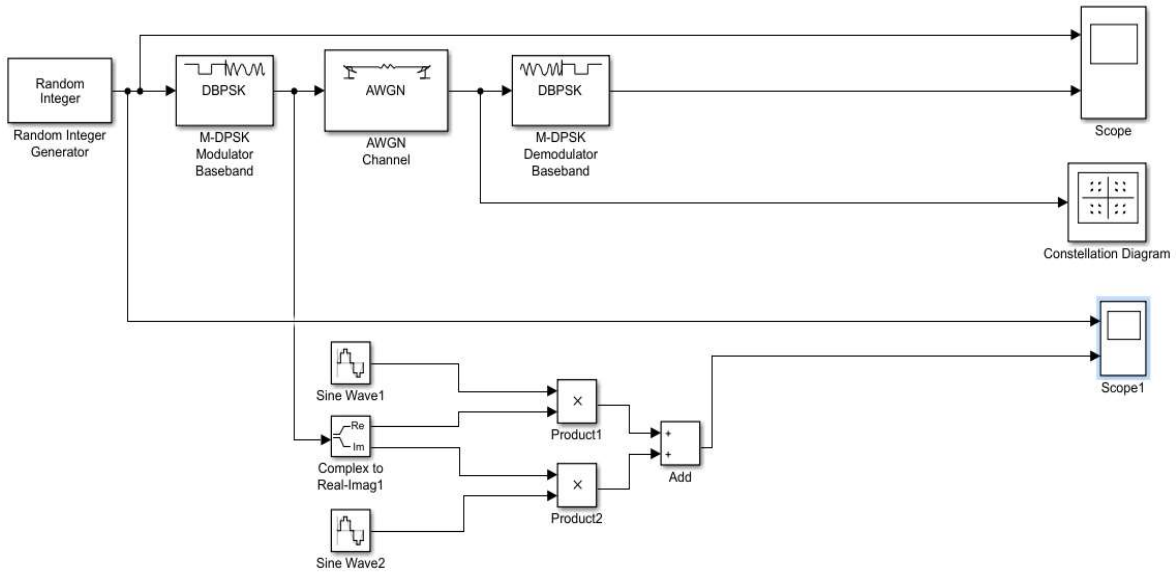

Constellation Diagram
File Tools View Simulation Help
Quadrature Amplitude
In-phase Amplitude
Ready
T=10.00


Scope
File Tools View Simulation Help
Input Wave
Demodulated Wave

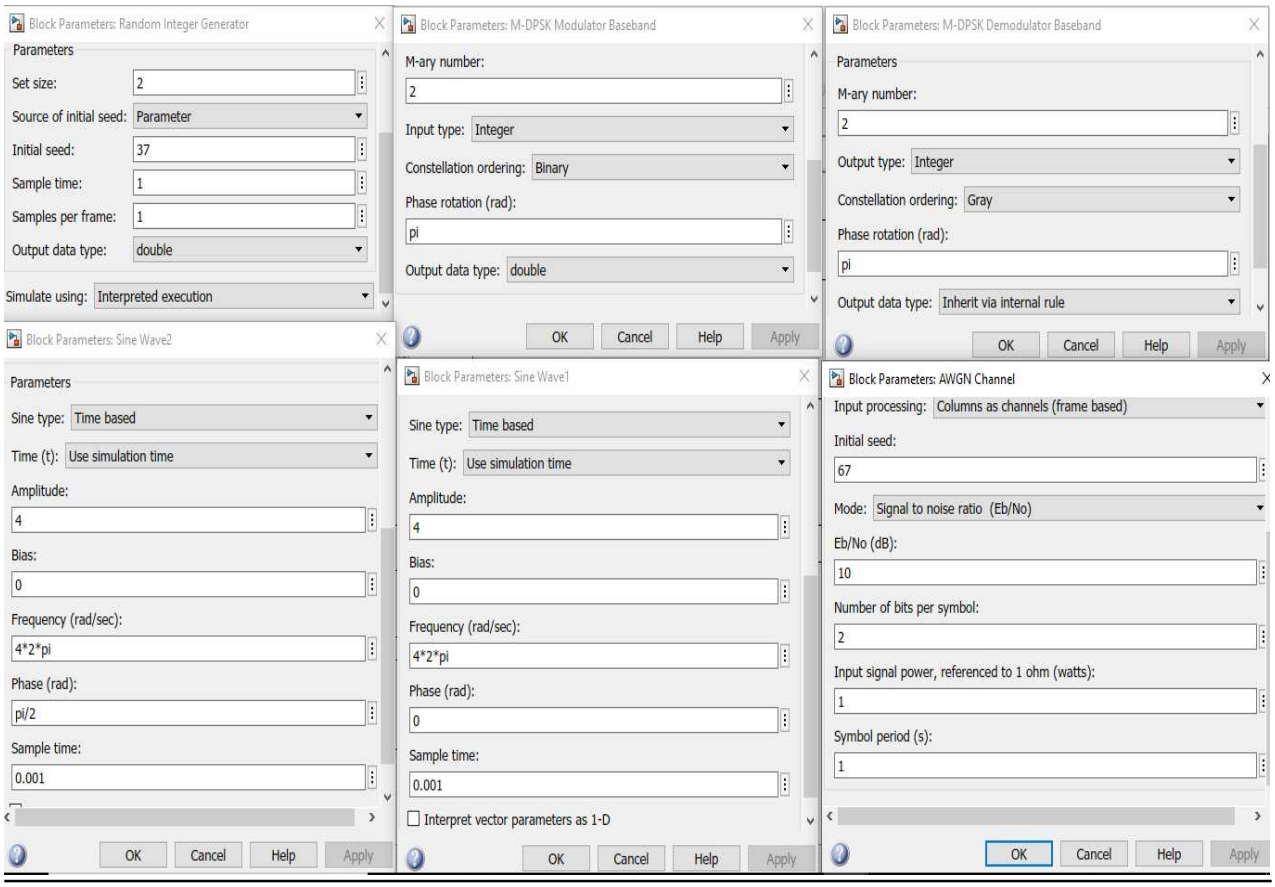

Scope1
File Tools View Simulation Help
Input
QPSK Modulated Wave

Experiment 4: Test the performance of binary differential phase shift keying system by simulating the non-coherent detection of binary DPSK.

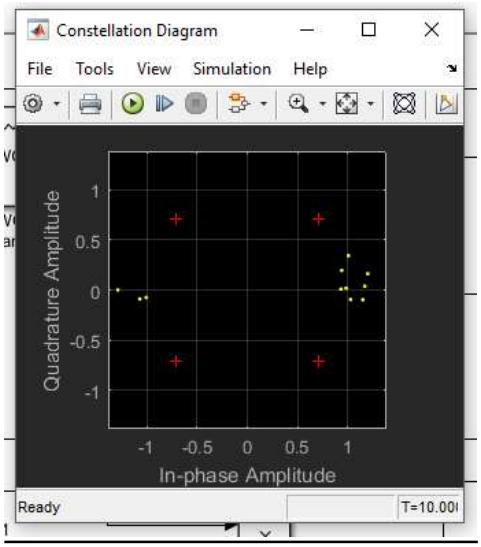
CIRCUIT:

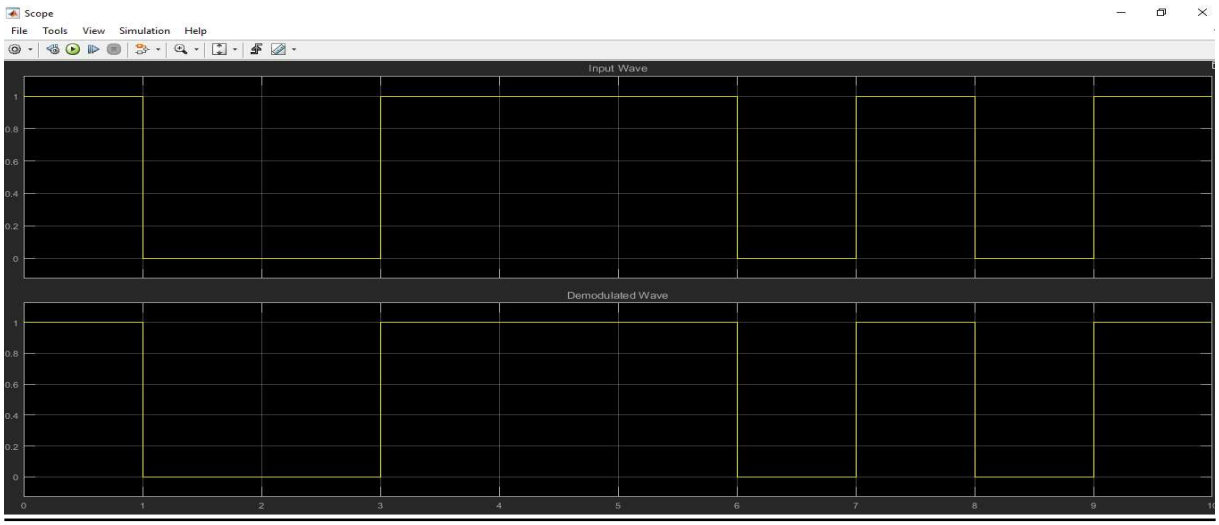


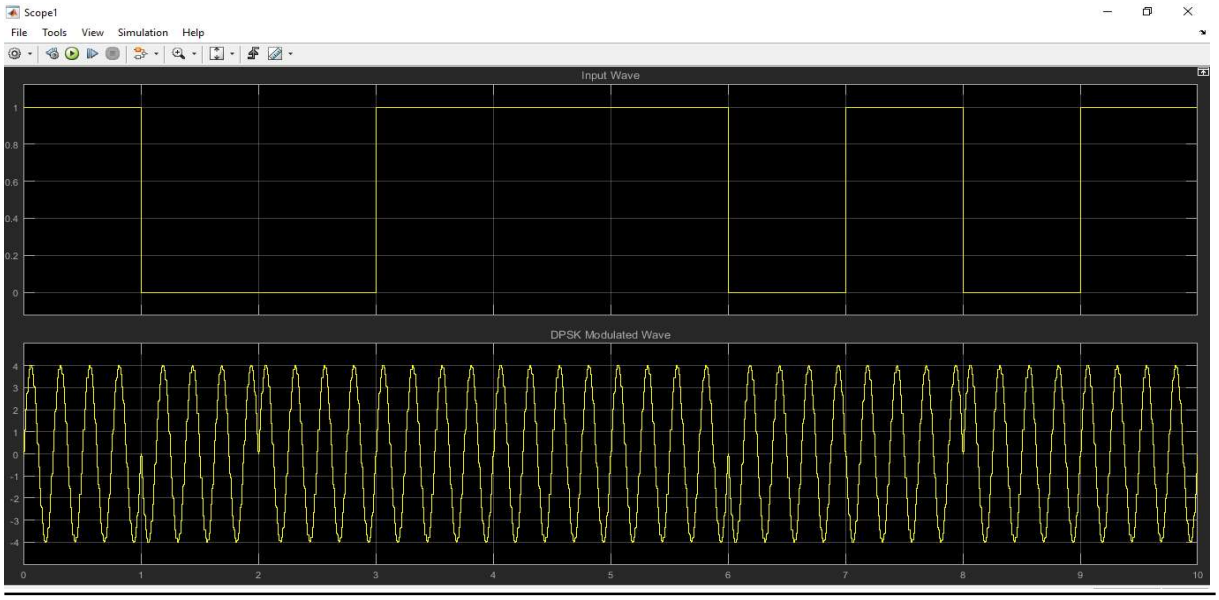
PARAMETERS:



OUTPUTS:


Constellation Diagram
File Tools View Simulation Help
Quadrature Amplitude
In-phase Amplitude
Ready
T=10.00


Scope
File Tools View Simulation Help
Input Wave
Demodulated Wave


Scope1
File Tools View Simulation Help
Input Wave
DPSK Modulated Wave