DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING (ODL)

EXPERIMENT 1

ELECTRONICS COMMUNICATION SYSTEM
DEE 4413

Name:

Student ID:

Date:

Lecturer’s Name:

Rubric for the lab report

Criteria	5	4	3	2	1
	Excellent	Good	Fair	Poor	Very Poor
To demonstrate the proteus simulation of the conversion analog signals to digital signals.	Fully able to demonstrate the proteus simulation of the conversion analog signals to digital signals.	Reasonably able to demonstrate the proteus simulation of the conversion analog signals to digital signals.	Quite able to demonstrate the proteus simulation of the conversion analog signals to digital signals.	Poor ability to demonstrate the proteus simulation of the conversion analog signals to digital signals.	Very poor ability to demonstrate the proteus simulation of the conversion analog signals to digital signals.

LAB EXPERIMENT 1
SIMPLE ANALOG TO DIGITAL CONVERTER

1.0 OBJECTIVE

- Introduction of Proteus 7.8V.
- The ability to convert analog signals to digital and vice-versa is very important in signal processing. The objective of an A/D converter is to determine the output digital word waveform corresponding to an analog input signal.

2.0 EQUIPMENT

- Proteus 7.8V
- ADC0808
- Data sheet of ADC0808

3.0 THEORY

Normally analogue-to-digital converter (ADC) needs interfacing through a microprocessor to convert analogue data into digital format. This requires hardware and necessary software, resulting in increased complexity and hence the total cost. The circuit of A-to-D converter shown here is configured around ADC 0808, avoiding the use of a microprocessor.

The ADC 0808 is an 8-bit A-to-D converter, having data lines D0-D7. It works on the principle of successive approximation. It has a total of eight analogue input channels, out of which any one can be selected using address lines A, B and C. Here, in this case, input channel IN0 is selected by grounding A, B and C address lines. Usually the control signals EOC (end of conversion), SC (start conversion), ALE (address latch enable) and OE (output enable) are interfaced by means of a microprocessor. However, the circuit shown here is built to operate in its continuous mode without using any microprocessor. Therefore the input control signals ALE and OE, being active-high, are tied to Vcc (+5 volts). The input control signal SC, being active-low, initiates start of conversion at falling edge of the pulse, whereas the output signal EOC becomes high after completion of digitisation. This EOC output is coupled to SC input, where falling edge of EOC output acts as SC input to direct the ADC to start the conversion.

As the conversion starts, EOC signal goes high. At next clock pulse EOC output again goes low, and hence SC is enabled to start the next conversion. Thus, it provides continuous 8-bit digital output corresponding to instantaneous value of analogue input. The maximum level of analogue input voltage should be appropriately scaled down below positive reference (+5V) level. The ADC 0808 IC requires clock signal of typically 550 kHz, which can be easily derived from an astable multivibrator constructed using 7404 inverter gates. In order to visualise the digital output, the row of eight LEDs (LED1 through LED8) have been used, wherein each LED is connected to respective data lines D0 through D7. Since ADC works in the continuous mode, it displays digital output as soon as analogue input is applied.

CIRCUIT DIAGRAM

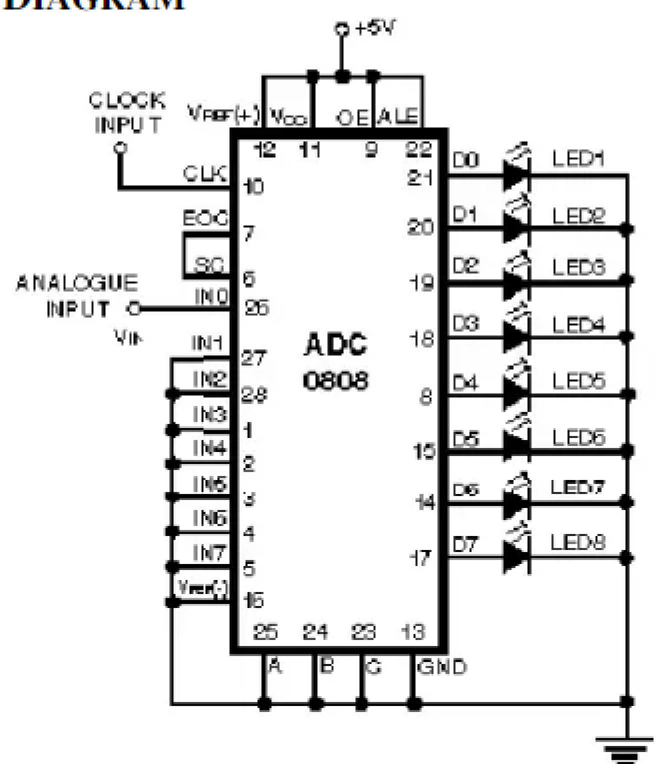

Fig 3.1 Simple Analog to Digital Converter)

PROCEDURE

1. Make the circuit as shown in fig.
2. Write the step by step procedure of simulation of Analog to Digital converter.

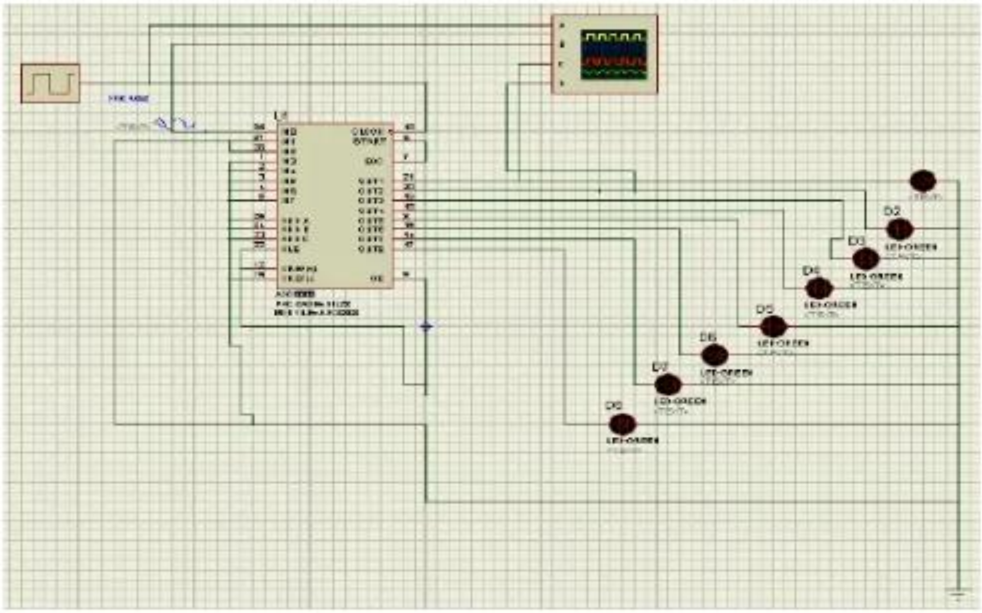

Fig 3.2 Proteus Simulation of A/D conversion

OUTPUT WAVEFORM

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EXPERIMENT 2

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Criteria	5	4	3	2	1
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To demonstrate the proteus simulation of the pulse amplitude modulation	Fully able to demonstrate the proteus simulation of the pulse amplitude modulation	Reasonably able to demonstrate the proteus simulation of the pulse amplitude modulation	Quite able to demonstrate the proteus simulation of the pulse amplitude modulation	Poor ability to demonstrate the proteus simulation of the pulse amplitude modulation	Very poor ability to demonstrate the proteus simulation of the pulse amplitude modulation

LAB EXPERIMENT 2
PULSE AMPLITUDE MODULATION

4.0 OBJECTIVE

- To study the waveform of pulse amplitude modulation.

5.0 EQUIPMENT

- PROTEUS 7.7

6.0 THEORY

PULSE-AMPLITUDE MODULATION is modulation in which the amplitude of each pulse is controlled by the instantaneous amplitude of the modulation signal at the time of each pulse. PAM is the simplest form of pulse modulation. This technique transmits data by varying the voltage or power amplitudes of individual pulses in a timed sequence of electromagnetic pulses. In other words, the data to be transmitted is encoded in the amplitude of a series of signal pulses. PAM can also be used for generating additional pulse modulations.

Pulse-amplitude modulation has also been developed for the control of light-emitting diodes (LEDs), especially for lighting applications. LED drivers based on the PAM technique offer improved energy efficiency over systems based upon other common driver modulation techniques such as pulse-width modulation (PWM) as the forward current passing through an LED is relative to the intensity of the light output and the LED efficiency increases as the forward current is reduced.

Pulse-amplitude modulation LED drivers are able to synchronize pulses across multiple LED channels to enable perfect colour matching. Due to the inherent nature of PAM in conjunction with the rapid switching speed of LEDs it is possible to use LED lighting as a means of wireless data transmission at high speed.

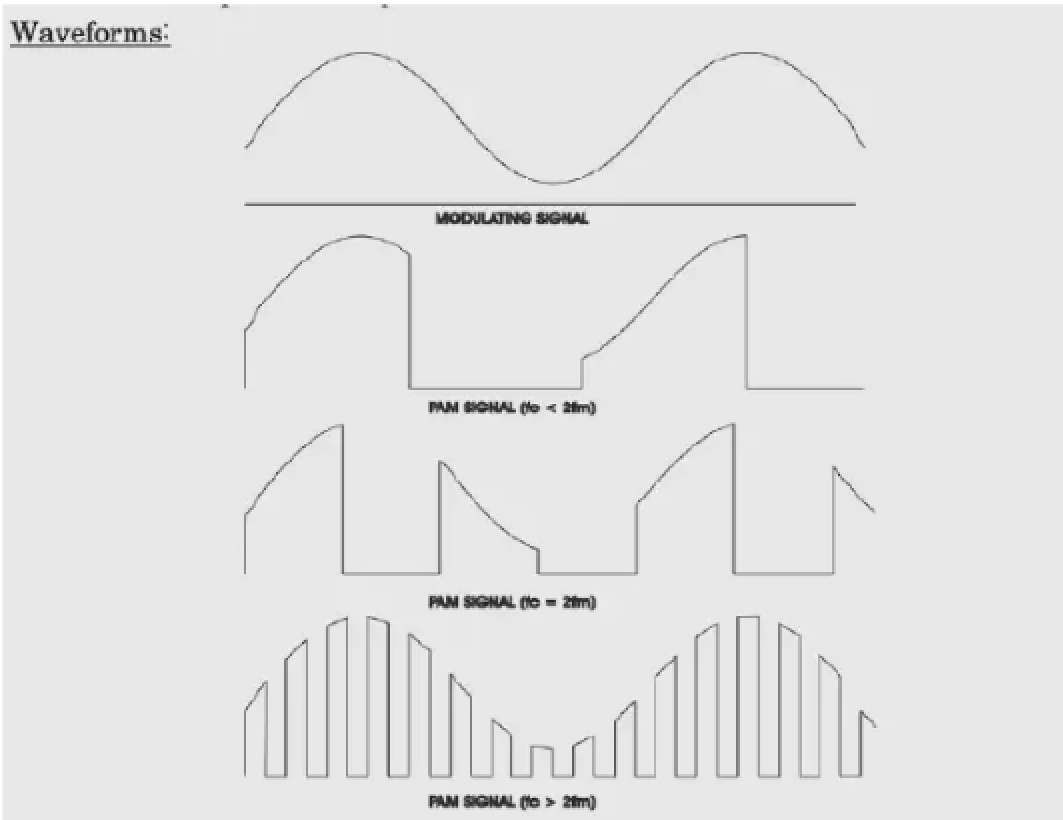

Figure 6.1: PAM signal at different frequencies

PROCEDURE:

1. Connection are made as shown in the circuit diagram.
2. Apply the square wave carries signal of 2V peak to peak amplitude with frequency $f_c = 5$ k Hz.
3. Apply sine wave modulating signal with frequency $f_m = 100$ Hz with 5Vpp amplitude and 3V DC shift(use function generator.
4. Observe the PAM output.
5. Observe the demodulation signal at the output of the low pass filter.
6. Repeat the steps 2 to 5 for $f_c = 2\ f_m$ & $f_c < 2\ f_m$

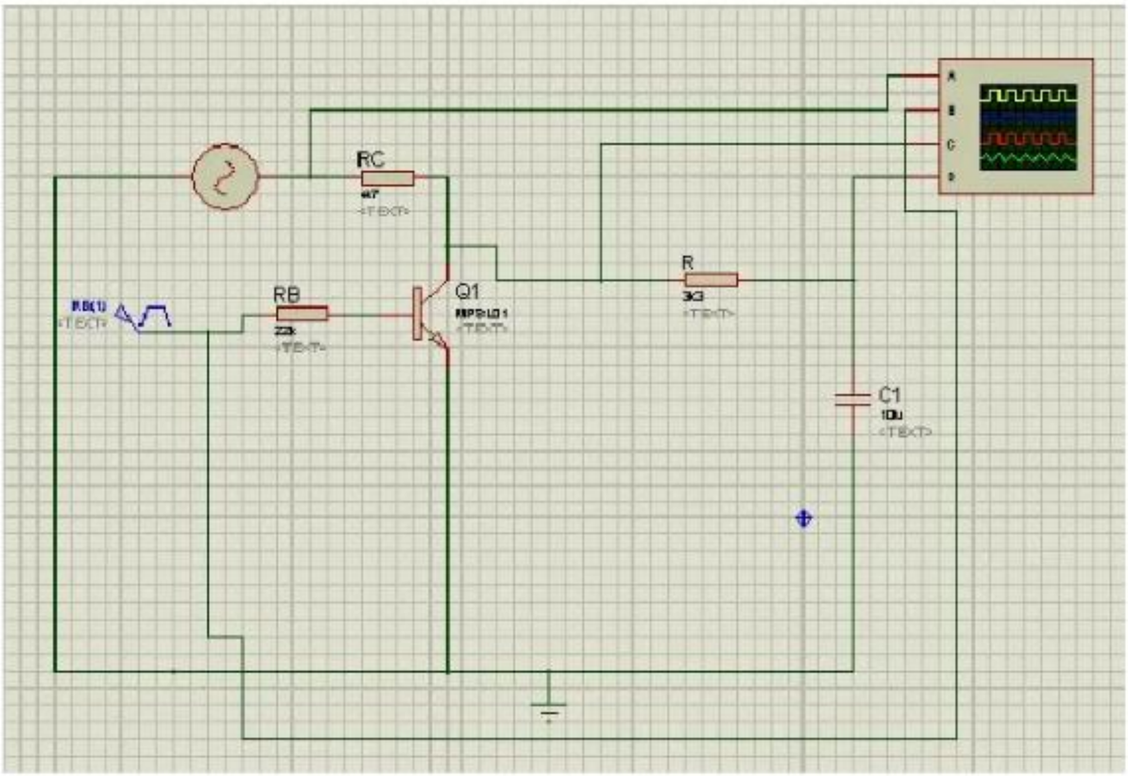

Figure 6.2: Proteus Simulation of PAM

OUTPUT WAVEFORM

Question :

Q.1 What is the relationship between fc and fm?

Q.2 What will happen if fc>fm ?

Q.3 What will happen if fc<fm?

Q.4 What are the maximum ratings of SL100 NPN?(Consult Datasheet)

Q.5 At the demodulator part of the circuit LPF is used. State how LPF is working here? And find the relationship between R and C.

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EXPERIMENT 3

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Criteria	5	4	3	2	1
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LAB EXPERIMENT 3
PULSE WIDTH MODULATION

7.0 OBJECTIVE

- To study the waveform of pulse width modulation.

8.0 EQUIPMENT

- PROTEUS 7.7

9.0 THEORY

To transmit a signal f(t) that is band limited to fm Hz, it is only necessary to transmit the information about its sample values at $(2fm)^{-1}$ second interval (recall Nyquis Theory). It is possible o represent each sample by a pulse. Certain parameters of thr pulse(such as amplitude, width or position)can be varied depending on the value of he sample. In other words, one of the parameters of the pulse vary in proportion to f(t). Thus, a series of modulation scheme are evolved. Consider Figure given below where types of modulation scheme are illustrated.

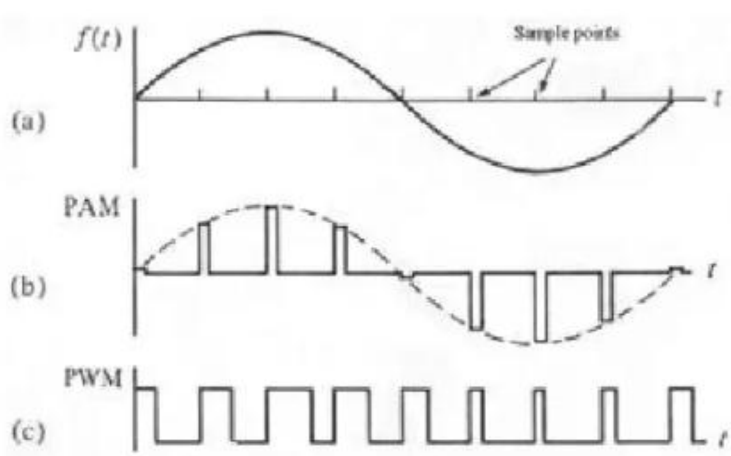

Fig 8.1 Types Of Modulation

PWM (Pulse Width Modulation)

As it was mentioned in the above, Pulse Width Modulation (PWM) encodes a signal into periodic pulse of equal amplitude but varying width. The width of a pulse at a given point in time is proportional to the amplitude of the message signal at the time. For example, a large value of the message signal corresponds to the width pulse, and a small value of the message yields a narrow pulse. The width of the pulse can be described in terms of its duty cycle, which is defined as:

$$d = \frac{t_w}{t_d} \times 100\,\%$$

Where, tw = width of the pulse

td = period of the pulse.

Here, td is constant and tw varies.

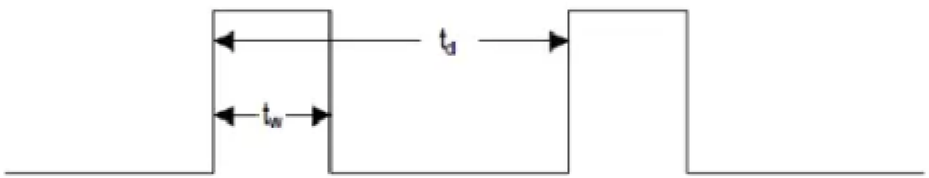

Fig.8.2 Defination of duty cycle

In PWM, there is a linear relationship between the duty cycle (d) and amplitude of message signal (V_{in}). This relationship can be written as following:

$$d \propto V_{in}$$
$$\Rightarrow d = M_d \cdot V_{in}$$

Where, M_d is the modulation index.

PROCEDURE

1. Connections are made according to the circuit diagram.
2. Keep the modulating signal with the minimum amplitude, observe the output at pin 3.

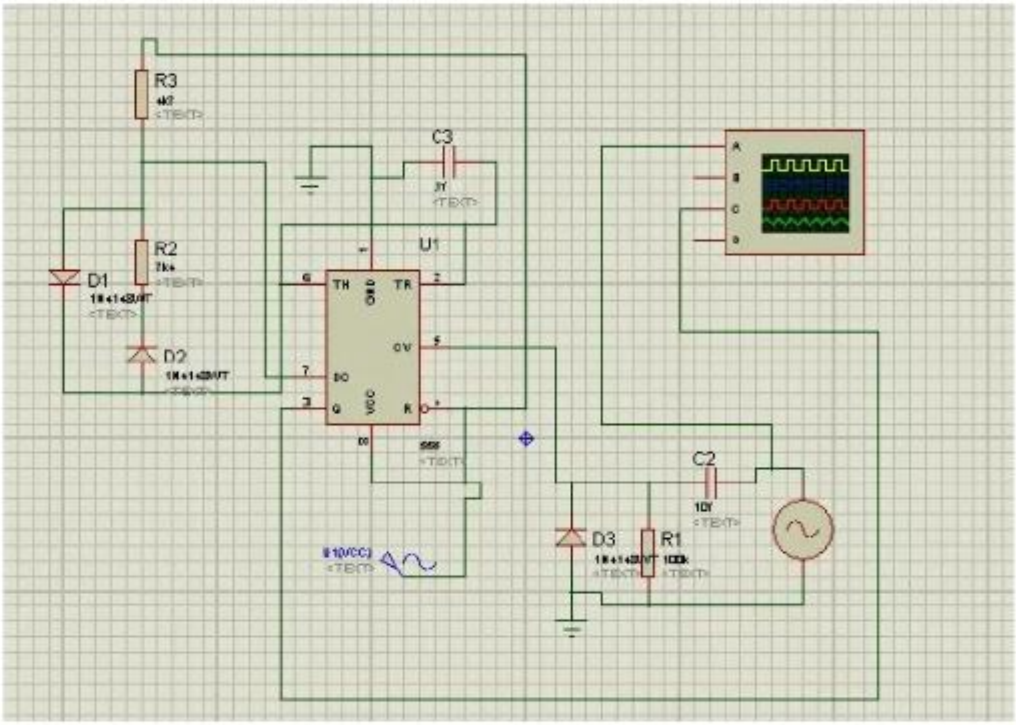

Fig 8.3 Proteus Simulation for PWM

OUTPUT WAVEFORM

Questions

Q1. Write the pin configuration of 555 IC?

Q2. What is the difference between mono stable and astable 555IC?

Q3. What are the uses of PWM Wave.?

Q4. What is the difference between PWM and PAM?

Q5. What is duty cycle? What is the relation between duty cycle and pulse width?

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EXPERIMENT 4

ELECTRONICS COMMUNICATION SYSTEM
DEE 4413

Name:

Student ID:

Date:

Lecturer's Name:

Rubric for the lab report

Criteria	5	4	3	2	1
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To demonstrate the proteus simulation of the amplitude shift keying	Fully able to demonstrate the proteus simulation of the amplitude shift keying	Reasonably able to demonstrate the proteus simulation of the amplitude shift keying	Quite able to demonstrate the proteus simulation of the amplitude shift keying	Poor ability to demonstrate the proteus simulation of the amplitude shift keying	Very poor ability to demonstrate the proteus simulation of the amplitude shift keying

LAB EXPERIMENT 4
AMPLITUDE SHIFT KEYING, MODULATION AND DEMODULATION

10.0 OBJECTIVE

- To understand the waveform of amplitude shift keying.

11.0 EQUIPMENT

- PROTEUS 7.7

12.0 THEORY

Amplitude-shift keying (ASK) is a form of modulation that represents digital data as variations in the amplitude of a carrier wave.

Any digital modulation scheme uses a finite number of distinct signals to represent digital data. ASK uses a finite number of amplitudes, each assigned a unique pattern of binary digits. Usually, each amplitude encodes an equal number of bits. Each pattern of bits forms the symbol that is represented by the particular amplitude. The demodulator, which is designed specifically for the symbol-set used by the modulator, determines the amplitude of the received signal and maps it back to the symbol it represents, thus recovering the original data. Frequency and phase of the carrier are kept constant.

Like AM, ASK is also linear and sensitive to atmospheric noise, distortions, propagation conditions on different routes in PSTN, etc. Both ASK modulation and demodulation processes are relatively inexpensive. The ASK technique is also commonly used to transmit digital data over optical fiber. For LED transmitters, binary 1 is represented by a short pulse of light and binary 0 by the absence of light. Laser transmitters normally have a fixed "bias" current that causes the device to emit a low light level. This low level represents binary 0, while a higher-amplitude light wave represents binary 1.

PROCEDURE

Write the step by step procedure of Proteus simulation of Amplitude Shift Keying.

CIRCUIT DIAGRAM

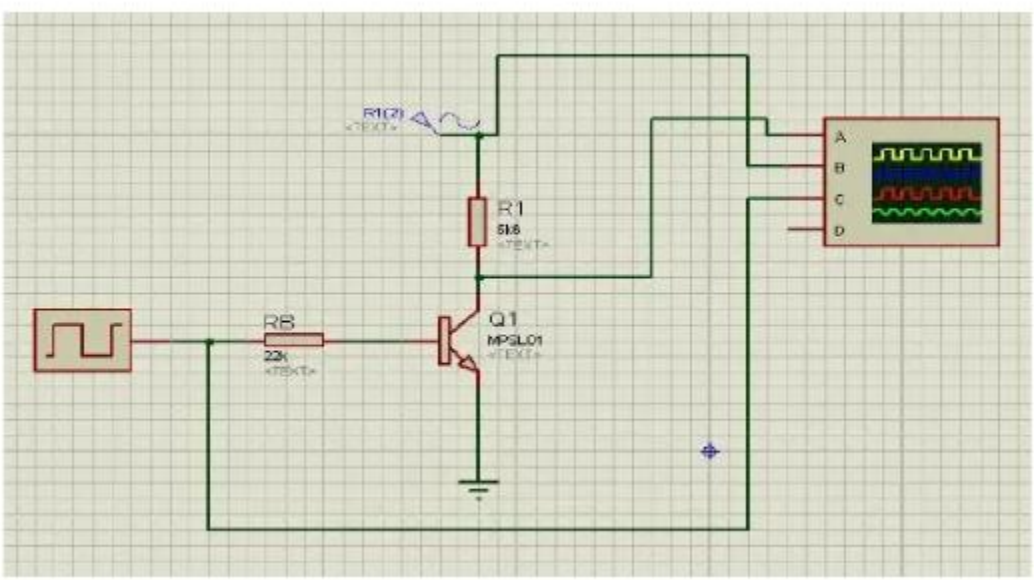

Fig 10.1 Schematic of ASK Modulation

OUTPUT WAVEFORM

Questions:

1. What is Amplitude shift keying ASK?
2. What is the function and characteristics of SL100 in ASK?
3. State advantages of amplitude shift keying?
4. What is the application for amplitude shift keying?
5. What is the difference between amplitude shift keying and AM modulation system?