Question 1.
Draw diagrams for the following binary bit sequences and transmission techniques.

a) Show the flow of energy through a cable when transmitting 0101001011 using on-off keying.

b) Show the flow of energy though a cable when transmitting 0101001011 using Manchester encoding.

Question 2.
Which, if any, of the wave forms shown below could be an example of binary data being transmitted using Manchester encoding? Explain your answer. What sequence of 0s and 1s would be represented by each sequence you identify as an example of Manchester encoding.

![Waveforms](waveforms.png)

Question 3.
Suppose that we have the following declaration and assignment:

```java
String words;
words = "Your goal the sky, your aim the Star";
```

What would be the result of each of the following expressions?

a) `words.substring( 20, 23 )`

b) `words.indexOf("your")`

c) `words.substring( words.length() - 8 )`

d) `words.substring( words.indexOf("th"), words.indexOf("ky") )`

e) `words.substring( words.indexOf("the") ) + words.substring( 0, words.indexOf("the") - 1 )`

Question 4.
The program on the next page draws three buttons in a window. Initially, all three buttons are enabled, but pressing the buttons variably enables or disables the buttons. The method `someButton.isEnabled()` is a JButton method that returns true if `someButton` is enabled, and false otherwise.

Suppose that the buttons labeled “Sunny”, “Saturday”, and “Healthy” are clicked in sequence. Indicate which buttons will be enabled after the `buttonClicked` method is invoked in response to each of the three clicks in the following sequence.

a) After clicking Sunny?

b) And then clicking Saturday?

c) And finally clicking Healthy?

d) Starting from scratch (i.e. when the program first begins execution), is there a sequence of just one or two button clicks, that will leave Sunny and Saturday both enabled? Explain your answer.
public class MysteriousIf extends GUIManager {
    private final int WINDOW_WIDTH = 400;
    private final int WINDOW_HEIGHT = 75;

    private JButton sunny;
    private JButton saturday;
    private JButton healthy;

    public MysteriousIf() {
        this.createWindow( WINDOW_WIDTH, WINDOW_HEIGHT );
        sunny = new JButton("Sunny");
        saturday = new JButton("Saturday");
        healthy = new JButton("Healthy");

        contentPane.add(sunny);
        contentPane.add(saturday);
        contentPane.add(healthy);

        sunny.setEnabled(true);
        saturday.setEnabled(true);
        healthy.setEnabled(true);
    }

    public void buttonClicked( JButton which ) {
        healthy.setEnabled(false);
        if (which == sunny){
            if (saturday.isEnabled()){
                healthy.setEnabled(true);
            } else {
                saturday.setEnabled(true);
            }
            sunny.setEnabled(false);
        } else if ( !(which == saturday) ){
            saturday.setEnabled(true);
        } else if (which == healthy){
            if (saturday.isEnabled()){
                sunny.setEnabled(false);
            }
        } else {
            sunny.setEnabled(true);
            saturday.setEnabled(false);
            healthy.setEnabled(true);
        }
    }
}