1. Construct an 8-bit digital to analog converter (DAC) and determine the analog voltage output for the binary bit pattern 11010110. Available resources are a few 1kΩ, 2kΩ, 4kΩ, 8kΩ, 16kΩ, 32kΩ, 64kΩ and 128kΩ resistors, an 10V Li-ion battery, a 1V battery, and two 12V batteries. Assume 10V as 'bit-1' and 1V as 'bit-0'. Consider feedback resistor is equal to four times that of the minimum resistor.

2. Construct an LED flasher circuit using IC 555 where LED will be ON for 8s and OFF for 2s while the system is running.
   Determine the following specifications:

(i) mode of operation
(ii) frequency
(iii) t_H
(iv) t_L
(v) R_a and R_b. (Assume C=100uF)

3. Construct a 7-bit analog to digital converter (ADC) using successive approximation method and hence show the step wise conversion of an analog input signal of 30.09 V into 7-bit digital binary value.

4. Construct an R/2R, defining all its resistances, for an input of 01101. Consider the reference voltage for operation to be 10V.

5. Consider a system where a sensor is connected to a post beside a railway line. Whenever, a train passes through the post the sensor generates a HIGH pulse signal. That signal then adjusted and passed to a 555 Timer IC. As soon as the 555 timer IC's input gets the signal, a HIGH output pulse is generated in the output of that IC and closes the Railway gate for 3 minutes.

A system needs to be constructed using a 555 timer IC that will work the same as mentioned in above situation. Consider the external Resistor (R) and Capacitor (C) value as required.

(i) Determine the mode operation of the 555 timer IC for the system.

(ii)Draw the figure of the system and analyze the required external Resistor (R) and Capacitor (C) value.