After the completion of the course, students will be able to:

CO1: Familiarize with the fundamentals of number systems, Boolean algebra and Boolean function minimization techniques.
CO2: Analyze and design combinational circuits using logic gates.
CO3: Analyze state diagram and design sequential logic circuits using flip flops.
CO4: Understand the classification of signals and systems and learn basic signal operations and Fourier analysis.
CO5: Understand various steps involved in digitization and transmissions of a signal.

Note: Attempt All Questions

Q.1. [CO1] Find the simplest SOP expression using K-map for the following function:

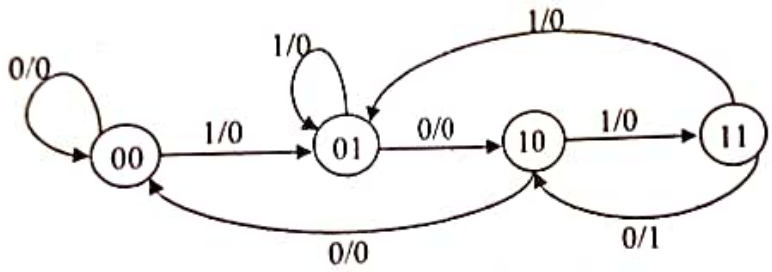
$$F(w, x, y, z) = \Sigma m(0, 1, 4, 6, 8, 9, 10, 12) + d(5, 7, 14)$$

Also find Essential Prime Implicants (EPI) for the above given function. **[4]**

Q.2. [CO2] Design a BCD to Excess-3 (XS-3) code converter. **[4]**

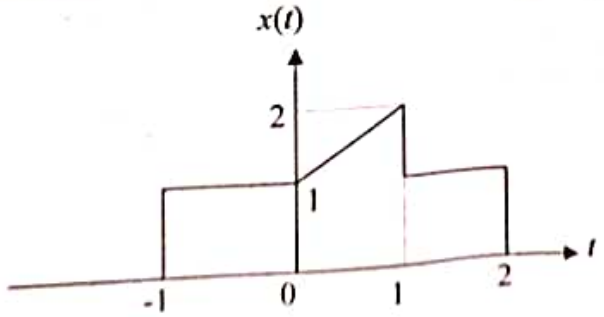
Q.3. [CO3] Explain the working of 4 bit ring counter using D flip flop and draw its timing diagram. **[3]**

Q.4. [CO3] Implement the synchronous sequential circuit using D flip flop for the given state diagram. **[4]**



Q.5. [CO4] For the signal $x(t)$ as shown in below Figure, draw the graph of following signals: **[3]**

(a) $x(-t+2)$ (b) $x(\frac{3}{5}t)$



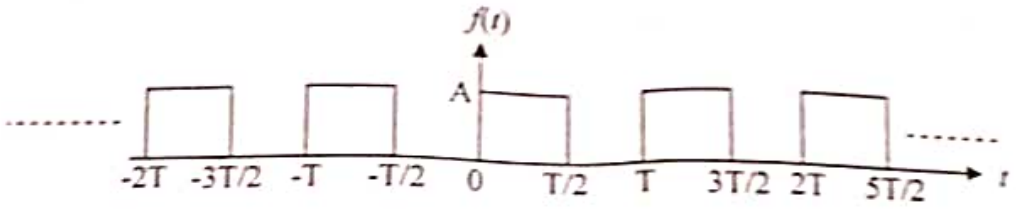
Q.6. [CO4] Determine whether the following signals are periodic or not? If periodic, determine the fundamental period.

(a) $\sin\left(\frac{2\pi}{3}n\right)+\cos\left(\frac{2\pi}{5}n\right)$ (b) $\sin(2t)+\cos\left(\sqrt{3}t\right)$ [3]

Q.7. [CO4] Check the causality and linearity properties of following system:

$$y(t)=x^2(t)+x(t-4)$$ [2]

Q.8. [CO4] Find the complex Fourier series coefficient for k = 0 (DC component) for the given periodic waveform. [2]



Q.9. [CO4] Find the Fourier transform of the signal defined as:

$$x(t)=e^{-t}\sin(5t)u(t)$$ [3]

Q.10. [CO5] State Sampling theorem and hence determine the Nyquist rate and Nyquist interval corresponding to each of the following signals:

(a) $m(t)=1+\cos(200\pi t)+\sin(400\pi t)$

(b) $m(t)=10\cos(40\pi t)\cos(300\pi t)$ [3]

Q.11. [CO5] For the binary sequence given as 10110, draw the output waveforms for the following modulation schemes and signalling formats:

(a) BASK

(b) BPSK

(c) Bipolar NRZ (AMI NRZ)

(d) Manchester (Split phase) [4]