8. Convolute the following two continuous time signals $x_1(t) = e^{-2t}u(t)$ and $x_2(t) = x(t+2)$.

9. Show that if the sampling rate is equal to or greater than twice the highest message frequency, then the message $m(t)$ can be recovered from natural sampled signal by low pass filtering. Sketch the relevant waveform and spectrum.

10. From basics, realize a constant-K low pass filter to cut-off at 1.4 kHz with a terminating resistance of 450Ω. State the assumptions made.

(5 × 5 = 25 marks)

Part C

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. Determine the complex exponential Fourier series expansion of the periodic signal :

$$x(\theta) = \begin{cases} A \sin\theta\,; & 0 \le \theta \le \pi \\ 0 \quad ; & \pi \le \theta \le 2\pi. \end{cases}$$

Or

12. Find the Fourier series co-efficients of periodic signal $x(t) = \begin{cases} 1, & |t| < T_1 \\ 0, & T_1 < |t| < \dfrac{T}{2}. \end{cases}$

Also draw its spectrum.

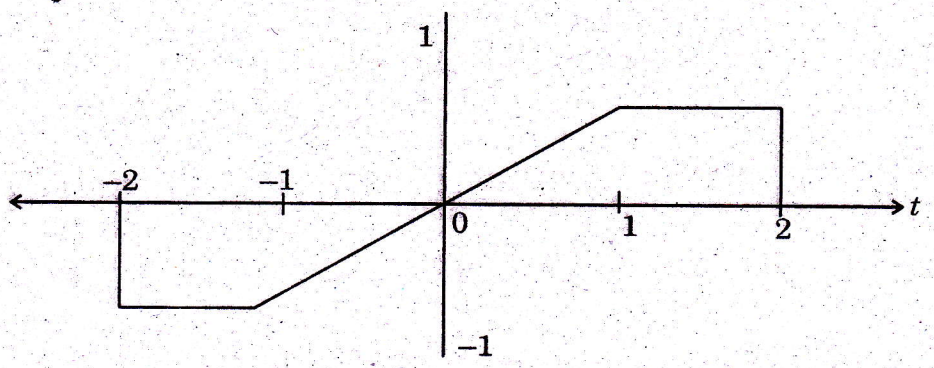
Module 2

13. (a) Find the Fourier Transform of $f(t) = e^{-\alpha t^2}$. (7 marks)

(b) Explain the transmission of rectangular pulse through an ideal low pass filter. (5 marks)

Or

14. (a) Find the Fourier Transform of the following signal :



(9 marks)

(b) What is the physical significance of causality of LTI system ? (3 marks)