Exam.Code:0927
Sub. Code: 6572

2122

B.E. (Electronics and Communication Engineering)

Third Semester

EC-302: Signals and Systems

Time allowed: 3 Hours Max. Marks: 50

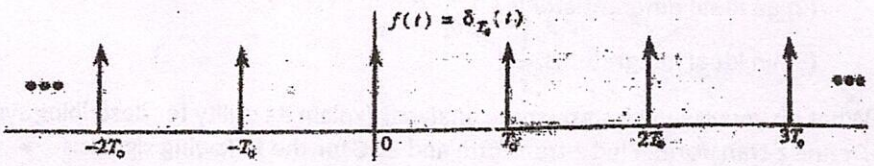
NOTE: *Attempt <u>five</u> questions in all, including Question No. I which is compulsory and selecting two questions from each Part.*

x-x-x

I. (a) What is an LTI system? (1)
(b) Can discrete-time signals be termed as digital signals? Explain. (1)
(c) Define power signal. (1)
(d) What is pole-zero plot? (1)
(e) What is difference between zero-input response and zero state response of a linear system? (2)
(f) What are advantages of using Laplace transform over Fourier transform? (2)
(g) Describe the concept of Region of Convergence. (2)

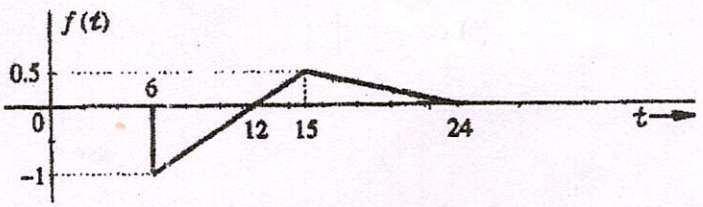
Part- A

II. (a) State and prove frequency shifting property of Fourier transform. What is its significance? (4)
(b) Find the exponential Fourier series and sketch the corresponding spectra for the impulse train $\delta_{T_0}(t)$ as shown in the following figure. (3)



(c) Explain the concept of stability as applied to continuous systems. (3)

III. (a) For the signal $f(t)$ shown in figure, sketch the following signals.



(1) $f(-t)$
(2) $f(t+6)$
(3) $f(3t)$
(4) $f\left(\frac{t}{2}\right)$ (4)

(b) Define system. Explain its classification. For the systems described by the equations below, with the input $f(t)$ and output $y(t)$, determine which of following is time invariant system and which is time variant system.

(1) $y(t) = f(t-2)$

(2) $y(t) = t\,f(t-2)$ (6)

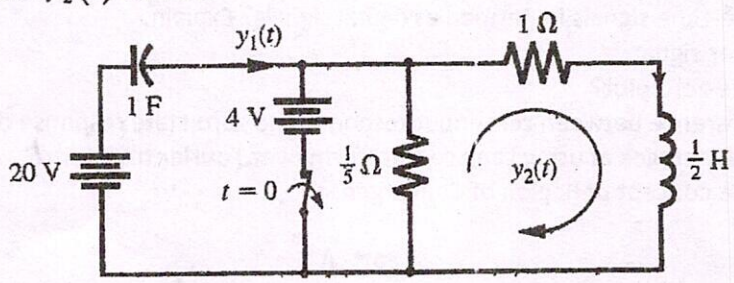
P.T.O.

IV. (a) State and prove frequency shifting property of Fourier transform. What is its significance? (4)
(b) State and prove sampling theorem. What is aliasing? How to overcome it? (6)

Part- B

V. (a) Find the discrete time Fourier transform (DTFT) of $y(k)=\gamma^k u(k)$. (5)
(b) Explain and prove the time convolution property of DTFT. (5)

VI. (a) The switch in the following circuit is in the closed position for a long time before $t = 0$, when it is opened instantaneously. Using the concept of Laplace transformation, find the currents expressions for $y_1(t)$ and $y_2(t)$ for $t \geq 0$. (7)



(b) Show that the transfer function of:
(1) an ideal delay of T seconds is e^{-sT}.
(2) an ideal differentiator is s.
(3) an ideal integrator is $\frac{1}{s}$. (3)

VII. (a) What do you mean by state-space analysis. Explain its utility for describing systems? (4)
(b) Define z-transform. Find z-transform and ROC for the following signals:
(1) $\gamma^k u(k)$
(2) $\delta(k)$
(3) $\cos \beta k u[k]$ (6)

x-x-x