



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Fourth Semester, B.E. - Electronics and Communication Engineering

Semester End Examination; June - 2016

Fundamentals of Signals

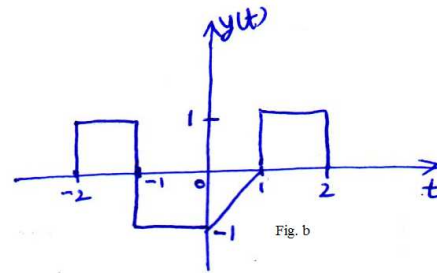
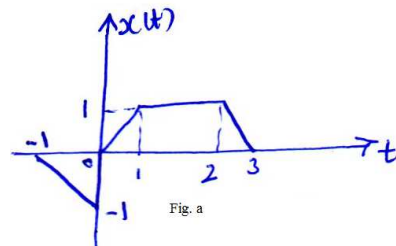
Time: 3 hrs

Max. Marks: 100

Note: Answer any **FIVE** full questions, selecting **ONE** full question from each **unit**.

UNIT - I

- 1 a. Mention the classification of signals and explain each with example. 8
- b. Function $x(t)$ and $y(t)$ are given in Fig. (a) and Fig. (b). Sketch the following signals.
 - i) $x(t+1)y(t-2)$ ii) $x(t)y(-1-t)$



- c. For the given function $x(t)$, determine whether the signal is periodic or non periodic, find the fundamental period. 6
 - i) $x(t) = e^{2t} \cos 15t$ ii) $x(t) = \sin \frac{2}{\pi t}$

- 2 a. Show that the product of two even signals or two odd signals is an even signal, while the product of even and odd signal is an odd signal. 8
- b. Determine whether the system is stable, casual, linear, time in variant and memory less. 8

- i) $y(t) = \frac{dx(t)}{dt}$ ii) $y(t) = x(2-t)$ 8

- c. For the given discrete time system, draw the serial and parallel block. 4
 $y(n) = 2x(n) + 3x(n-1) + \frac{1}{2}x(n-3) + 0.4x(n-4)$

UNIT - II

- 3 a. Perform the convolution integral of the following signals. 10
 $x(t) = t[u(t) - u(t-3)], \quad h(t) = t[u(t) - u(t-1)]$

- b. Explain convolution sum procedure with neat diagram at each stage, using an example. 10
 $x(n) = \left\{ \frac{1}{n}, 2, 3, 4 \right\}, \quad h(n) = \left\{ \frac{1}{n}, 1, 2, 2 \right\}$

- 4 a. Draw the direct form I and form II realization of the system. 10

i) $\frac{1}{3} \frac{d^2 y(t)}{dt^2} + \frac{3}{2} \frac{dy(t)}{dt} + y(t) = 3x(t) + 4 \frac{d^2 x(t)}{dt^2}$

ii) $4y(t) = \frac{1}{3}x(t) + 3 \frac{d^2 y(t)}{dt^2}$

- b. Find the total response for the given system .

$y''(t) + 3y'(t) + 2y(t) = x(t), t \geq 0$

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with $y(0) = 3$ and $y'(0) = 4$, if $x(t) = 4e^{-2t}$.

UNIT - III

- 5 a. State and prove the properties of Fourier series

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- i) Linearity ii) Convolution iii) Time shift

- b. Determine the complex exponential Fourier series representation.

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i) $x_1(t) = \cos w_0 t$ ii) $x_2(t) = \cos 4t + \sin 6t$

- 6 a. State and prove the convolution and modulation properties of Fourier transform.

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- b. Find the Fourier transform of the following signals and sketch the graph.

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i) $x(t) = e^{-at}$, $a > 0$ ii) $x(t) = \sin(\pi t)e^{-2t}u(t)$

UNIT - IV

- 7 a. State and prove the Parseval's and differentiation properties of DTFT.

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- b. Determine the DTFS coefficient for the given function.

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i) $x(n) = \{1, 2, 3, 4\}$ ii) $x(n) = \cos\left[\frac{\pi}{4}n\right]$

- 8 a. State and prove Sampling theorem. Define aliasing distortion.

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- b. State and prove the following properties of DTFT,

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- i) Frequency shift ii) Modulation

UNIT - V

- 9 a. State and prove timing shifting and convolution properties of Z-transform.

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- b. Find the Z - transform of the following discrete time signals, indicate ROC

i) $x(n) = 2^n u(n) + 3\left(\frac{1}{2}\right)^n u(n)$

12

ii) $x(n) = 3\left(\frac{-1}{2}\right)^n u(n) - 2\left[3^n u(n-1)\right]$

iii) $x(n) = 3^{n+1}u(n) - 2\left(\frac{1}{2}\right)^n u(-n-1)$

- 10 a. Find the Inverse Z-transform of the following X(Z),

i) $X(Z) = \log\left(\frac{1}{1-az^{-1}}\right), |Z| > |a|$ ii) $X(Z) = \log\left(\frac{1}{1-a^{-1}z}\right), |Z| < |a|$

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- b. Explain the properties of ROC in Z - transform

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