

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (S, FE) / S5 (PT) (S,FE) Examination June 2024 (2015 Scheme)

**Course Code: EE307****Course Name: SIGNAL AND SYSTEMS**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 5 marks.*

Marks

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|---|--|-----|
| 1 | Check for linearity and time variance of $\frac{dy(t)}{dt} + 4ty(t) = x(t)$ | (5) |
| 2 | Obtain the transfer function for:
$\frac{d^3y(t)}{dt^3} + 6\frac{d^2y(t)}{dt^2} + 11\frac{dy(t)}{dt} + 6y(t) = 3\frac{d^2x(t)}{dt^2} + 7\frac{dx(t)}{dt} + 5x(t)$ | (5) |
| 3 | State and prove linearity and time shifting property of Fourier transform | (5) |
| 4 | Explain sampling process and sampling theorem | (5) |
| 5 | Find the Z transform and ROC of the signal $x(n) = n u(n)$ | (5) |
| 6 | Find the initial value of $x(z) = \frac{1}{1-z^{-2}}$ | (5) |
| 7 | State any 5 properties of Discrete Fourier series. | (5) |
| 8 | Explain the properties of non-linear systems | (5) |

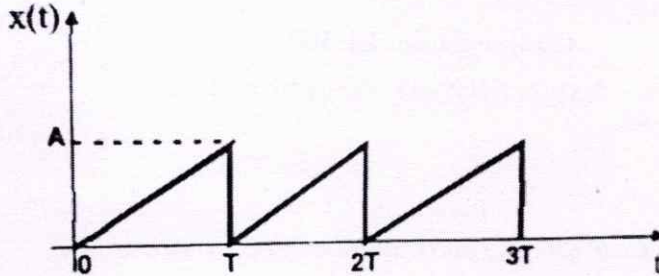
PART B*Answer any two full questions, each carries 10 marks.*

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|----|---|------|
| 9 | a) Sketch the following signals
(i) $3r(t-1)$ (ii) $r(-0.5t+2)$ | (7) |
| | b) Explain any three types of signals with example | (3) |
| 10 | a) Find the unilateral Laplace transform of $x(t) = \cos \omega t$ | (5) |
| | b) Plot the pole zero diagram of the $\frac{s+2}{s^2+2s+2}$ | (5) |
| 11 | Define causality and time invariance of a system. Check for causality and time invariance of
(i) $y(t) = x^2(t)$
(ii) $y(t) = x(t) $ | (10) |

PART C

Answer any two full questions, each carries 10 marks.

- 12 Obtain the trigonometric Fourier series coefficient of the periodic function shown (10)
below:



- 13 a) Explain aliasing. (5)
 b) Find Nyquist rate and Nyquist interval for the signal (5)
 $X(t) = 1/2\pi \cos(3000\pi t) + \cos(5000\pi t)$
- 14 a) Differentiate between Zero order hold and first order hold system (5)
 b) Determine the response of the LTI system whose input $x(n)$ and impulse response $h(n)$ are given by $x(n) = \{1, 2, 3, 1\}$ and $h(n) = \{1, 2, 1, -1\}$ using matrix method (5)
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PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Write short note on random signals and random process (5)
 b) Find the initial value and final value of $\frac{1}{1+2z^{-1}-3z^{-2}}$ (5)
- 16 Determine the Z transform and ROC of (10)
 a) $x(n) = 0.8^n u(-n-1)$ b) $x(n) = 0.5^n u(n)$
- 17 Determine the Fourier series representation of the discrete time signal (10)
 and sketch the frequency spectrum

$$x(n) = \{\dots, 0, \frac{1}{2}, 1, \frac{3}{4}, 0, -\frac{3}{4}, -1, -\frac{1}{2}, \dots\}$$

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