

Hall Ticket Number:

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**KAMALA INSTITUTE OF TECHNOLOGY & SCIENCE, SINGAPUR**  
**23EC28PC305**

**II.B. Tech. I. Semester Regular Examinations, Dec. 2024/Jan. 2025**  
**SIGNALS AND SYSTEMS**

**(Electronics & Communication Engineering)**

**Time: 3 Hours**

**Max.Marks:60**

Note: Question paper consists of Part-A & Part-B.

i) **Part-A** for 10M, ii) **Part-B** for 50marks

- Part A** is compulsory, consists of 10 sub questions from all units carrying equal marks.
- Part-B** consists of **10 questions** (numbered from 2 to 11) carrying **10marks** each. From each unit there are 2 questions and the students should answer one of them. Hence the student should answer **5 questions** from **Part-B**.

| PART-A |                                                                                                                                                | (10Marks) |     |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----|
| Q.No   | Questions                                                                                                                                      | Marks     | BTL |
| 1.a)   | Define energy and power signals.                                                                                                               | 1         | 1   |
| 1.b)   | Define Mean square error of a signal.                                                                                                          | 1         | 1   |
| 1.c)   | What are Dirichlet conditions?                                                                                                                 | 1         | 1   |
| 1.d)   | Explain Parseval's theorem for Fourier Series.                                                                                                 | 1         | 2   |
| 1.e)   | Define signal bandwidth and system bandwidth.                                                                                                  | 1         | 1   |
| 1.f)   | What is Paley- Wiener criterion?                                                                                                               | 1         | 1   |
| 1.g)   | Define ROC of Laplace transform?                                                                                                               | 1         | 1   |
| 1.h)   | What is natural sampling?                                                                                                                      | 1         | 1   |
| 1.i)   | Write any two properties of Z transform.                                                                                                       | 1         | 1   |
| 1.j)   | Define ESD and PSD.                                                                                                                            | 1         | 1   |
| PART-B |                                                                                                                                                | (50Marks) |     |
| Q.No.  | Questions                                                                                                                                      | Marks     | BTL |
| 2. a)  | Find whether the following signals are periodic or not? If periodic determine the fundamental Period for<br>(i) $3\sin 200\pi t + 4 \cos 100t$ | 5M        | 1   |
| b)     | Explain how a function can be approximated by a set of orthogonal function.                                                                    | 5M        | 5   |
| OR     |                                                                                                                                                |           |     |
| 3. a)  | Check whether the following system is (a) Causal or non-causal b) Time invariant or time variant for<br>(i) $y(n)=x(2n)$                       | 5M        | 4   |
| b)     | Derive the expression for evaluating mean square error.                                                                                        | 5M        | 3   |
| 4. a)  | State and Prove any Five Properties of the Fourier Series.                                                                                     | 5M        | 5   |
| b)     | Find the Fourier transform of the signals $x(t) = e^{-at} u(t)$ .                                                                              | 5M        | 1   |
| OR     |                                                                                                                                                |           |     |
| 5. a)  | Find the trigonometric Fourier series for the periodic signal shown in below                                                                   | 5M        | 1   |

|              |                                                                                                                                                                                                   |           |          |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------|
|              |                                                                                                                                                                                                   |           |          |
| <b>b)</b>    | Find the Fourier transform of the following<br>(i) $\text{sgn}(t)$ (ii) $\sin \omega_0 t$                                                                                                         | <b>5M</b> | <b>1</b> |
| <b>6. a)</b> | Consider a stable LTI system that is characterized by the differential equation<br>$d^2y(t)/dt^2 + 4dy(t)/dt + 3y(t) = dx(t)/dt + 2x(t)$<br>find the response for an input $x(t) = e^{-t} u(t)$ . | <b>5M</b> | <b>2</b> |
| <b>b)</b>    | Explain the Filter characteristics of linear systems<br>explain with neat diagrams.                                                                                                               | <b>5M</b> | <b>5</b> |
| <b>OR</b>    |                                                                                                                                                                                                   |           |          |
| <b>7. a)</b> | Derive the transfer function and impulse response of an LTI system.                                                                                                                               | <b>5M</b> | <b>3</b> |
| <b>b)</b>    | Perform Graphical Convolution of $x(n) = \{1, 2, 3, 4\}$ and $h(n) = \{4, 3, 2, 1\}$ .                                                                                                            | <b>5M</b> | <b>3</b> |
| <b>8. a)</b> | Find the Laplace transform of the signal<br>$x(t) = e^{-at} u(t) - e^{-bt} u(-t)$ .                                                                                                               | <b>5M</b> | <b>1</b> |
| <b>b)</b>    | State and Prove Sampling theorem for band limited signals.                                                                                                                                        | <b>5M</b> | <b>5</b> |
| <b>OR</b>    |                                                                                                                                                                                                   |           |          |
| <b>9. a)</b> | State and prove time differentiation and time integration property of Laplace transform.                                                                                                          | <b>5M</b> | <b>5</b> |
| <b>b)</b>    | Give the comparison between Impulse, Natural and Flattop sampling Techniques.                                                                                                                     | <b>5M</b> | <b>4</b> |
| <b>10.a)</b> | Find the inverse Z-transform of $X(z)$ given<br>$X(z) = 1/(1-az^{-1})$ , ROC; $ z  >  a $                                                                                                         | <b>5M</b> | <b>1</b> |
| <b>b)</b>    | Determine the autocorrelation function and energy spectral density of $x(t) = e^{-at} u(t)$ .                                                                                                     | <b>5M</b> | <b>5</b> |
| <b>OR</b>    |                                                                                                                                                                                                   |           |          |
| <b>11.a)</b> | Derive the relation between convolution and correlation.                                                                                                                                          | <b>5M</b> | <b>3</b> |
| <b>b)</b>    | Utilize the Properties of Z-transform. Find the Z-transform of following signal $x(n) = 2^n u(n-2)$                                                                                               | <b>5M</b> | <b>3</b> |

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