



III B. Tech II Sem Supply End Examination, January 2023

Signal and Systems

(Electrical and Electronics Engineering)

Time: 3 Hours.**Max. Marks: 70**

Note: 1. Question paper consists: Part-A and Part-B.

2. In Part - A, answer all questions which carries 20 marks.

3. In Part - B, answer any one question from each unit.

Each question carries 10 marks and may have a, b as sub questions.

PART- A**(10*2 Marks = 20 Marks)**

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|-------|---|----|-----|-----|
| 1. a) | List the functions which can be used as orthogonal functions | 2M | C01 | BL1 |
| b) | Write mathematical expressions for unit step and impulse function | 2M | C01 | BL1 |
| c) | Find whether the signal $x(t)=\sin 2t+a \cos 8t$ is periodic or not | 2M | C02 | BL3 |
| d) | State Dirichlet's conditions | 2M | C02 | BL1 |
| e) | Compare signal bandwidth and system bandwidth | 2M | C03 | BL2 |
| f) | Write the Paley-Wiener criteria for physical realization of system | 2M | C03 | BL1 |
| g) | Define ROC significance in Laplace transform of the signal | 2M | C04 | BL1 |
| h) | Write the relation between Laplace transform and Z-Transform. | 2M | C04 | BL1 |
| i) | State the significance of sampling theorem. | 2M | C05 | BL1 |
| j) | Define correlation operation. | 2M | C05 | BL1 |

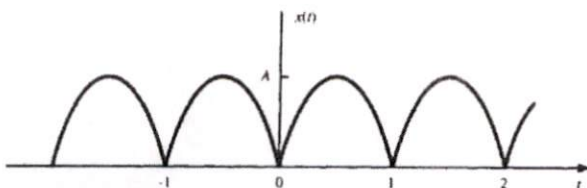
PART- B**(10*5 Marks = 50 Marks)**

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|------|--|----|-----|-----|
| 2 a) | Derive the relation for mean square error when a signal is approximated by orthogonal functions. | 5M | C01 | BL6 |
| b) | Find the even and odd components of the step function $u(t)$ | 5M | C01 | BL3 |

OR

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|---|--|-----|-----|-----|
| 3 | Write the mathematical expressions for unit impulse, unit step and signum function and show them graphically | 10M | C01 | BL1 |
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| 4 a) | | 5M | C02 | BL3 |
|------|--|----|-----|-----|



Obtain the trigonometric Fourier series coefficients for the signal

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|----|--|----|-----|-----|
| b) | Find the Fourier transform of the signals $\cos \omega_0 t$ and $e^{-\alpha t} u(t)$ | 5M | C02 | BL3 |
|----|--|----|-----|-----|

OR

- 5 Derive the relation between trigonometric Fourier series coefficient and exponential Fourier series coefficients 10M C02 BL6
- 6 a) Determine the system function and unit sample response of the system described by the difference equation $y(n)=0.5y(n-1)+2x(n)$ 5M C03 BL3
 b) Prove the conditions required for the distortion less transmission system 5M C03 BL3
- OR
- 7 Find the output $y(t)$ of continuous time LTI system with impulse response $h(t)=e^{-2t}u(t)$ and input $e^{-2t}u(t)$. 10M C03 BL3
- 8 a) List the properties of Laplace transform 5M C04 BL1
 b) Determine the Z-transform and ROC of the signal $x(n)=[3(2^n) - 4(3^n)]u(n)$ 5M C04 BL3
- OR
- 9 Find the Z-Transform of the signal $x[n]=(0.8)^n u[n] - (0.3)^n u[-n+1]$; 10M C04 BL3
- 10 a) Define autocorrelation and list the properties and prove them. Find power spectral density of autocorrelation $R_x(\tau)=25+\frac{4}{1+6\tau}$ 5M C05 BL3
 b) Explain the applications of correlation function in filtering 5M C05 BL4
- OR
- 11 Find the power spectral density of the autocorrelation function is given by $R_x(t)=\begin{cases} 1-|t|; & -1 \leq t \leq 1 \\ 0; & \text{otherwise} \end{cases}$ 10M C05 BL3

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