**20EC302**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular / Supplementary) DEGREE EXAMINATION** | | | |
| **February, 2023** | **Electronics and Communication Engineering** | | |
| **Third Semester** | **Signals and Systems** | | |
| **Time:** Three Hours | | **Maximum: 7**0 Marks | |
| *Answer Question No.1 compulsorily.* | | | (14X1 = 14 Marks) |
| *Answer ONE question from each unit.* | | | (4X14=56 Marks) |
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| 1. | a) | | | Define a signal. | CO1 | | L1 | | 1M |
|  | b) | | | Calculate fundamental period of g(t) = 10sin12πt+4cos18πt. | CO1 | | L3 | | 1M |
|  | c) | | | Define Stable system. | CO1 | | L1 | | 1M |
|  | d) | | | Specify the equations relating Unit Impulse, Unit Step and Signum functions. | CO1 | | L2 | | 1M |
|  | e) | | | Relate Trigonometric and Exponential Fourier Series coefficients. | CO2 | | L3 | | 1M |
|  | f) | | | Are Fourier Series and Fourier transform related? Justify your answer. | CO2 | | L1 | | 1M |
|  | g) | | | Can any CT periodic signal be represented using Fourier series? Justify your statement. | CO2 | | L2 | | 1M |
|  | h) | | | What is the Fourier Transform of 1? | CO3 | | L1 | | 1M |
|  | i) | | | Compare Fourier Series and Fourier Transforms. | CO3 | | L3 | | 1M |
|  | j) | | | State Time scaling property of CT Fourier transforms. | CO3 | | L1 | | 1M |
|  | k) | | | What is Aliasing? | CO4 | | L1 | | 1M |
|  | l) | | | State Sampling theorem. | CO4 | | L1 | | 1M |
|  | m) | | | Define Auto and cross correction functions. | CO4 | | L1 | | 1M |
|  | n) | | | Define Energy spectral density. | CO4 | | L1 | | 1M |
|  | | **Unit - I** | | | | | | | |
| 2. | a) | | Find , , , and , if is as shown in Fig. 1.         [2M+2M+3M+3M=10M]    Fig. 1 | | CO1 | L1 | | 10M | |
|  | b) | | List and explain different operations performed on CT signals. | | CO1 | L1 | | 4M | |
|  | | **(OR)** | | | | | | | |
| 3. | a) | | Test whether the following systems are Static, Time invariant, Linear, Causal and Stable: | | CO1 | | L2 | | 7M |
|  | b) | | Is an energy signal, a power signal, or neither? If it is an energy signal, find its energy. If it is a power signal, find its average power. | | CO1 | | L4 | | 7M |
|  | | **Unit - II** | | | | | | | |
| 4. | a) | | Compute the trigonometric Fourier series expansion of the signal shown in  Fig. 2.    Fig. 2 | | CO2 | | L4 | | 8M |
|  | b) | | State and prove any THREE properties of Fourier Series. | | CO2 | | L2 | | 6M |
|  | | **(OR)**  **P.T.O**  **20EC302** | | | | | | | |
| 5. | a) | | Find the compact Trigonometric Fourier series for the triangular periodic signal shown in Fig. 3 and sketch the amplitude and phase spectra for . Take advantage of the symmetry.  Fig. 3 | | CO2 | | L3 | | 8M |
|  | b) | | Compute the Exponential Fourier series expansion of the signal shown in  Fig. 4.    Fig. 4 | | CO2 | | L4 | | 6M |
|  | | **Unit - III** | | | | | | | |  | **(OR)** |
| 6. | a) | | Find the Fourier transform of the waveform shown in Fig. 5    Fig. 5 | | CO3 | | L3 | | 7M |
|  | b) | | Find the Fourier Transform of the following standard signals:   1. Unit Step Signal 2. Everlasting sinusoid cos ω0t 3. Signum function Sgn(t)   Also, draw the corresponding Fourier spectrums. | | CO3 | | L2 | | 7M |
|  | | **(OR)** | | | | | | | |
| 7. | a) | | State and prove the following properties of continuous time Fourier transforms:   1. Frequency Shifting 2. Convolution in time 3. Differentiation in time 4. Differentiation in frequency | | CO3 | | L2 | | 8M |
|  | b) | | Illustrate the ideal LPF, HPF and BPF characteristics. Are they physically realizable? Justify your answer. | | CO3 | | L3 | | 6M |
|  | | **Unit - IV** | | | | | | | |
| 8. | a) | | Define Nyquist rate and then find the Nyquist rate for the signals:  i) Rect 600t ii) 20 Cos 400πt. | | CO4 | | L4 | | 7M |
|  | b) | | Compare Energy Spectral Density and Power Spectral Density. | | CO4 | | L3 | | 7M |
|  | | **(OR)** | | | | | | | |
| 9. | a) | | How to represent a continuous time signal by its samples using Sampling Theorem?  Explain with the necessary equations and waveforms/Spectrums. | | CO4 | | L2 | | 7M |
|  | b) | | Derive the properties of cross-correlation function. | | CO4 | | L4 | | 7M |

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