**20EC302**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular) DEGREE EXAMINATION** | | | |
| **March, 2022** | **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) | | Determine the even and odd components of a signal x(t) = 2 + t + 3 + 4 | CO1 |  |
|  | b) | | What is the fundamental period of the signal x(t) = sin2(5t). | CO1 |  |
|  | c) | | Evaluate the integral | CO1 |  |
|  | d) | | Determine whether the LTI system with impulse response h(t) = et u(-t+3) is BIBO stable or not? | CO2 |  |
|  | e) | | State commutative property of convolution integral. | CO2 |  |
|  | f) | | State the conditions for the convergence of Fourier series. | CO2 |  |
|  | g) | | Determine the Fourier transform of the signal x(t) = 𝞭(-t +1) | CO3 |  |
|  | h) | | Write the properties of Frequency response of LTI system. | CO3 |  |
|  | i) | | Determine the frequency response of an LTI system with impulse response  h(t) = 𝞭(t+2) + 𝞭(t-2) | CO3 |  |
|  | j) | | Draw the frequency response of Ideal Band Pass Filter | CO3 |  |
|  | k) | | Determine the Nyquist rate of a signal x(t) = 3cos(100πt) + 2sin(300πt). | CO4 |  |
|  | l) | | Define Power Spectral Density. | CO4 |  |
|  | m) | | What are the differences between convolution and correlation? | CO4 |  |
|  | n) | | Determine the autocorrelation of the signal x(t) = δ(t) | CO4 |  |
| **Unit - I** | | | | | |
| 2. | a) | Determine whether the following signals are energy signals, power signals or neither   1. x(t) = te-2t u(t) 2. x(t) = sin(πt) | | CO1 | 7M |
|  | b) | Explain about Time shifting, Time Scaling & Time Reversal operations with examples. | | CO1 | 7M |
| **(OR)** | | | | | |
| 3. | a) | Sketch the following signals i) x1(t) = u(t+5) ii) x2(t) = u(t-5) iii) x3(t) = u(-t+5) iv) x4(t) = u(-t-5) | | CO1 | 7M |
|  | b) | Determine whether the following systems are Linear, Time-invariant, causal and stable   1. y(t) = t.cos(t) 2. y(t) = u(t+2) | | CO1 | 7M |
| **Unit - II** | | | | | |
| 4. | a) | How systems are classified and explain them with example. | | CO2 | 7M |
|  | b) | Find the convolution of the following signals x(t) = e-at u(t) and h(t) = e-bt u(t)  When i) a ≠ b ii) a = b | | CO2 | 7M |
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| **(OR)** | | | | | |
| 5. | a) | Determine the trigonometric Fourier Series coefficients of the following signal. | | CO2 | 7M |
|  | b) | Evaluate the graphical convolution of two signals *x*(t) and h(t) given below | | CO2 | 7M |
| **Unit - III** | | | | | |
| 6. | a) | State and prove any four properties of continuous-time Fourier transform. | | CO3 | 7M |
|  | b) | Determine the Fourier Transform of the following signal x(t). | | CO3 | 7M |
| **(OR)** | | | | | |
| 7. | a) | Determine the Fourier transform of a signal x(t) = e-2t cos(3t) u(t) | | CO3 | 7M |
|  | b) | Frequency response of an LTI system is given by H(jω) =  Find the response of the system to the input x(t) = te-2t u(t) | | CO3 | 7M |
| **Unit - IV** | | | | | |
| 8. | a) | State and prove Sampling theorem for low pass signals | | CO4 | 7M |
|  | b) | Find Autocorrelation and Energy Spectral Density of x(t) = e-2t u(-t) | | CO4 | 7M |
| **(OR)** | | | | | |
| 9. | a) | Prove that Autocorrelation exhibits conjugate symmetry | | CO4 | 7M |
|  | b) | Compare Energy Spectral Density and Power Spectral Density. | | CO4 | 7M |

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