## VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
*Accredited by NAAC with A++ Grade*
### B.E. (E.E.E.) VI-Semester Advanced Supplementary Examinations, August-2022
## Signals & Systems

Time: **3 hours**                                                                  Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

### *Part-A (10 × 2 = 20 Marks)*

| Q. No. | Stem of the question | M | L | CO | PO |
|--------|----------------------|---|---|----|----|
| 1. | Relate the Impulse signal, Step Signal and Ramp signal. | 2 | 3 | 1 | 2 |
| 2. | Express the signal x(t) in terms of Trigonometric and Exponential Fourier Series. | 2 | 1 | 1 | 1 |
| 3. | Show that Fourier transform of a periodic signal will be a train of impulses. | 2 | 2 | 1 | 1 |
| 4. | Write short notes on Dirichlet conditions for Fourier Transform. | 2 | 1 | 1 | 1 |
| 5. | What is an Anti aliasing Filter? | 2 | 1 | 2 | 1 |
| 6. | Develop relation between Fourier and Laplace Transform. In what way it is different from Fourier transform. | 2 | 3 | 1 | 2 |
| 7. | Verify the Discrete time Signal x(n)= sin(3n) is periodic or not. | 2 | 3 | 3 | 1 |
| 8. | Compute the Z-transform of $x(n)=a^{n+1}u(n+1)$. | 2 | 2 | 3 | 2 |
| 9. | Write about the Convolution Integral to find the output of the Continuous Time system. | 2 | 1 | 4 | 1 |
| 10. | Prove that Energy Spectral Density and Autocorrelation Function forms a Fourier transform Pair | 2 | 3 | 4 | 2 |

### *Part-B (5×8 = 40 Marks)*

| | | M | L | CO | PO |
|--------|----------------------|---|---|----|----|
| 11. a) | Check whether the following signal is periodic or not. If periodic, determine the fundamental period. <br> i) $x(t) = \cos\left(\frac{\pi}{3}t\right) + \sin\left(\frac{\pi}{4}t\right)$   ii) $x(t) = e^{-7t}\sin 10\pi t$ | 4 | 3 | 1 | 2 |
| b) | Derive the relation between trigonometric Fourier series and exponential Fourier series. | 4 | 2 | 1 | 1 |
| 12. a) | State and Prove convolution in time and differentiation in time properties of Fourier transform. | 4 | 1 | 1 | 1 |
| b) | Evaluate the Fourier transform of $x(t) = 1 - e^{|t|}\cos w_0 t$ | 4 | 3 | 1 | 2 |

| | | | M | L | CO | PO |
|---|---|---|---|---|---|---|
| 13. | a) | Compare Instantaneous Sampling, Natural sampling and flat top sampling. | 4 | 2 | 2 | 1 |
| | b) | Obtain the Inverse Laplace Transform of $X(S) = \dfrac{4}{(s+2)(s+4)}$ for ROCs  i)$Re(s) < -4$  ii)$Re(s) > -2$  iii)$-2 > Re(s) > -4$ | 4 | 3 | 3 | 2 |
| 14. | a) | Determine whether the following systems are linear or non-linear, time invariant or time variant. i) $y(n) = nx(n)$    ii)$y(n) = x(-n)$ | 4 | 2 | 3 | 2 |
| | b) | Compute initial value and final value of the following z-domain signals i) $X(Z) = \dfrac{1}{1 + 2Z^{-1} - 3Z^{-2}}$    ii)$X(Z) = \dfrac{2Z^{-1}}{1 - 1.8Z^{-1} + 0.8Z^{-2}}$ | 4 | 2 | 3 | 2 |
| 15. | a) | Determine the Convolution of the following signals $x(t) = e^{-3t}u(t)$   and   $h(t) = u(t-1)$ | 4 | 3 | 4 | 2 |
| | b) | List the similarities and differences in convolution and correlation of two sequences. | 4 | 2 | 4 | 1 |
| 16. | a) | Determine the Fourier Series of half wave rectified sine function $x(t) = \begin{cases} A\sin\omega t & for & 0 \le t \le \pi \\ 0 & for & \pi \le t \le 2\pi \end{cases}$ | 4 | 3 | 1 | 2 |
| | b) | A continuous time system is represented by the following differential equation $\dfrac{d^2 y(t)}{dt^2} + 3\dfrac{dy(t)}{dt} + 2y(t) = 2x(t)$ Determine the impulse response of the system using Fourier Transform | 4 | 3 | 1 | 3 |
| 17. | | Answer any *two* of the following: | | | | |
| | a) | Explain the Sampling theorem for Band limited Signals. | 4 | 1 | 2 | 1 |
| | b) | Determine the Discrete Fourier Series of . $x(n) = \cos^2(\dfrac{\pi}{6}n)$ | 4 | 3 | 3 | 2 |
| | c) | Determine the Convolution and Correlation of the following discrete sequences X(n)=[1 2 4 6]      h(n)=[2 1 2 1] | 4 | 2 | 4 | 2 |

M : Marks;   L: Bloom's Taxonomy Level;   CO; Course Outcome;   PO: Programme Outcome

| i) | Blooms Taxonomy Level – 1 | 20% |
|---|---|---|
| ii) | Blooms Taxonomy Level – 2 | 35% |
| iii) | Blooms Taxonomy Level – 3 & 4 | 45% |

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