

(Compulsory Question)

9. (a) Define Decimation and interpolation operation in DSP. 4
- (b) Obtain the cascade realization of the Transfer function : 4
- $$H(z) = \frac{216z^3 + 96z^2 + 24z}{(2z+1)(12z^2 + 7z + 1)}$$
- (c) Find the inverse DFT of  $X(k) = \{1, 2, 3, 4\}$ . 4
- (d) Explain the major classification of signals. 3

**J-21-0107**

**B. Tech. EXAMINATION, 2021**

Semester VI (CBCS)

DIGITAL SIGNAL PROCESSING (ECE)

EC-604

Time : 2 Hours

Maximum Marks : 60

---

*The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.*

---

**Note :** Attempt *Four* questions in all, selecting *one* question from any of the Sections A, B, C and D. Q. No. **9** is compulsory.

**Section A**

1. Check whether the signals are Energy signals or Power signals, also determine the power and energy : 15
- (a)  $x(t) = u(t) - u(t - 1)$
- (b)  $x(t) = r(t) - r(t - 2)$

- (c)  $x(t) = e^{-4t} u(t)$   
 (d)  $x(t) = e^{-10t} u(t)$   
 (e)  $x(t) = \cos(2\pi t)u(t)u(2 - t)$ .

2. Check the system described by the differential equation : **15**

$$y(t) \frac{d^2 y(t)}{dt^2} + 3t \frac{dy(t)}{dt} + y(t) = x(t) \text{ is}$$

- (a) Static or Dynamic  
 (b) Linear or Non-linear  
 (c) Causal or Non-causal  
 (d) Time variant or Time invariant.

### Section B

3. Describe the properties of Discrete Fourier Transform. **15**
4. Find the circular convolution of the given sequence using DFT : **15**

$$x_1(n) = \{1, 1, 2, 2\} \text{ and } x_2(n) = \{1, 2, 3, 4\}$$

### Section C

5. A first order Butterworth low pass transfer function with a 3 dB cutoff frequency at  $\Omega_c$  is given by :

$$H_a(s) = \frac{\Omega_c}{s + \Omega_c}$$

Design a single pole low pass filter with a 3 dB cutoff frequency and Bandwidth of  $(0.2\pi)$  using the bilinear transformation. **15**

6. Develop a canonic direct form realization of the transfer function : **15**

$$H(z) = \frac{6z^5 + 8z^3 - 4}{2z^5 + 6z^4 + 10z^3 + 8z}$$

### Section D

7. Explain the concept of multirate signal processing along with applications and advantages of it. **15**
8. Explain the need for the use of window sequence in the design of FIR filter. Describe the window sequence generally used and compare the properties. **15**