

- N. B.:** (1) Attempt any **three** questions from **each** section.  
 (2) Answers to the **two** sections must be written in **same** answer sheet.  
 (3) **Figures** to the **right** indicate **full** marks.  
 (4) **Assume additional data if necessary** but state the same clearly.  
 (5) **Symbols** have their **usual meanings** unless stated otherwise.  
 (6) Use of **simple calculator** and statistical tables are **allowed**.

## Section I

- 1 a. What is twiddle factor? Find the IDFT of sequence with DFT [8, -2, 0, -2] 6  
 b. Define a rectangular window and derive the frequency response of the rectangular window. 6
- 2 a. For each impulse response listed below, determine the corresponding system is 6  
     A. Causal              B. stable  
     i.  $h(n) = \delta(n) + \sin(\pi n)$   
     ii.  $h(n) = e^{2n}u(n-1)$   
 b. What is pole-zero plot? Why it is necessary? Draw pole-zero diagram for a system having transfer function  $H(z) = 1 + z^{-4}$  6
- 3 a. Explain Remez Exchange algorithm used in the design of Optimal FIR filters. 6  
 b. What are maximal Ripple filter? How do you obtain maximal ripple filters? 6
- 4 a. Using block diagram explain analog to digital conversion process. 6  
 b. Differentiate between fixed-point arithmetic and floating-point arithmetic. Find 2's compliment of 0.0101 6
- 5 a. What is purpose of Chirp Z transform algorithm? Explain algorithm in detail. 6  
 b. Explain in detail the bilinear transformation technique used for digitizing an analog filter. 6

## Section II

- 6 a. State and explain general form of a two dimensional difference equation for a realizable filter. 6  
 b. Describe two-dimensional z transform and compute two-dimensional z-transform of following sequence: 7  

$$x(n_1, n_2) = \begin{cases} K^{n_1} u_0(n_1 - n_2) & n_1, n_2 > 0 \\ 0 & \text{otherwise} \end{cases}$$
- 7 a. Give a simple (5 x 4) add-shift multiplier. How this multiplier can be realized? 6  
 b. Discuss in detail Direct Form FIR filter. 7

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|----|----|---|----------|
| 8  | a. | Discuss quantization effects in FFT algorithms.   | <b>6</b> |
|    | b. | Explain in place 16 point, radix 4 DIT FFT with normally ordered input and digit reversed output. | <b>7</b> |
| 9  | a. | Discuss real time convolution via FFT using a single RAM and one AE.                              | <b>6</b> |
|    | b. | Give and explain structure of a simplified general purpose computer.                              | <b>7</b> |
| 10 | a. | Explain Homomorphic Processing of speech.   | <b>6</b> |
|    | b. | Draw and explain block diagram of a modern RADAR system.  | <b>7</b> |
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