## MANIPAL UNIVERSITY

**SCHOOL OF INFORMATION SCIENCES**
**SECOND SEMESTER MASTER OF ENGINEEING - ME(EMBEDDED SYSTEMS)**
**DEGREE MAKE-UP EXAMINATION - JULY 2017**
**Monday, 10 July, 2017**
**Time: 10:00 to 13:00**

## Digital Signal Processing [ESD 602]

**Marks: 100** **Duration: 180 mins.**

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### Answer all the questions.

1) Compute the DFT of the sequence x(n) = [1, -1, -1, -1, 1, 1, 1, -1] using DIT-FFT algorithm. Draw the flow graph indicating the intermediate values (10)

2) Realize the following system function using Direct form-I, Direct form-II and Cascade / Parallel forms (10)

$H(z) = [(z^2 + 0.5z +1)(z + 0.6)] / [(z^2 + 0.6z + 0.2)(z - 0.8)]$

3) Design an ideal linear phase FIR low pass filter with a cutoff frequency of $\pi/2$ radians, using frequency sampling technique. Assume 11 tap coefficients (10)

4) It is desired to remove low frequencies of an analog signal with a digital linear phase FIR filter. The 3 dB frequency is 2 KHz, transition width is 500 Hz and the stop band attenuation is 50 dB. Use suitable window function to design the filter to meet the above specification. The filter employs a sampling frequency of 10 KHz. (10)

5) A third ordered Chebychev lowpass filter with 3 dB frequency of 5 KHz is to be realized using digital system. The sampling period is 10 $\mu$sec. Realize the filter using Impulse Invariance technique (20)

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| 6) | Provide polyphase filter structures of interpolator and decimator. Explain how these structures are in a position to provide the required sampling rate conversion | (10) |
| 7) | What is a digital filter bank? Explain how an uniform DFT filter bank can be implemented using multirate signal processing | (10) |
| 8) | Explain LMS adaptive algorithm. Explain how LMS adaptive algorithm is made use to make the Weiner Filter Configuration adaptive based on the steepest descent technique | (10) |
| 9) | Explain the internal and external memory organization in TMS320C6X DSP Processor | (10) |