# B.E.E. 4ᵀᴴ YEAR 1ˢᵀ SEMESTER EXAMINATION, 2018

## SUBJECT: - ADVANCED INSTRUMENTATION - I

**Time: Three hours**                    **Full Marks 100**
                                          **(50 marks for each part)**

Use a separate Answer-Script for each part

| No. of Questions | PART-I | Marks |
|---|---|---|
| | **Answer any two** | **2X25=50** |
| 1. a) | What is Sensor Fusion? Explain different levels of such a fusion strategy. | 2+8 |
| b) | Explain the operation of Direct Digital Synthesis (DDS) based Frequency synthesizer. | 9 |
| c) | A digital frequency synthesizer employs a 2.097152 MHz crystal oscillator and gives a 256 step-sinusoid. Determine the maximum and minimum output frequency if the number of fractional bit is 2. Also find out the frequency control word for these cases. | 6 |
| 2. a) | Draw a schematic of a digital vector voltmeter using synchronous detection technique. A phase-locked frequency synthesizer provides all internal references from a common reference source. Explain the principle of operation of such voltmeter. | 10 |
| b) | A Rough Set based decision rule generation system uses a real valued data table as given below. Generate the discretized decision table using maximal discernible heuristics. Show the optimum set of cuts. | 10 |

| Objects | Condition Attributes | | Decision Attribute |
|---|---|---|---|
| | A | B | |
| $U_1$ | 0.75 | 5.0 | 1 |
| $U_2$ | 1.25 | 3.5 | 1 |
| $U_3$ | 2.2 | 5.0 | 0 |
| $U_4$ | 0.75 | 2.25 | 0 |
| $U_5$ | 1.8 | 1.0 | 1 |
| $U_6$ | 1.25 | 3.5 | 0 |
| $U_7$ | 1.25 | 2.25 | 0 |
| $U_8$ | 2.2 | 1.2 | 0 |

| No. of Questions | PART-I | Marks |
|---|---|---|
| c) | From the discretized table generate the set of decision rules. | 5 |
| 3. a) | Describe different architectures of Supervisory Control and Data Acquisition (SCADA) Systems. | 8 |
| b) | What are the properties of a *mother-wavelet*? | 4 |
| c) | What are orthonormal bases in the context of Wavelet Transform? | 3 |
| d) | Samples of a signal is shown as $f = \{ 4, 4, 8, 8, 0, 0, 1, 2\}$. <br> ↑ <br> Find Wavelet coefficients after Haar Transform. Show that energy does not change after Haar transform | 5 |
| e) | Write down the algorithm for computing Continuous Wavelet Transform of a one dimensional signal. | 5 |

*Ref No: Ex/EE/T/414D/2018*

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| | | |
|---|---|---|
| 4. | Write notes on any *two* | $(2 \times 12\frac{1}{2} = 25)$ |
| a) | Lock-in-amplifier | |
| b) | Various modes for deploying SCADA systems | |
| c) | Wavelet Transform based denoising technique | |