

Test 1 - Applied Digital Control - 2024-2-27 – 1hr 15 min

Question 1 (25%)

In implementing a digital controller hardware, two solutions are selected:

- (i) Digital controller based on Micro-controller (e.g., embedded processor)
- (ii) Digital controller based on Digital Signal Processor (DSP)

For each of the selection above, state what are the advantages of using this selection?

Question 2 (25%)

Find the first 3 terms of the digital sequence, by applying long division inverse Z transform to the equation below.

$$F(z) = \frac{z^2+z}{z^2-3z+4}$$

Question 3 (25%)

Design a ladder logic circuit to implement the function specified below:

Function: Pedestrian crossing traffic light

Input: One push button (PB)

Outputs: Two coloured traffic lights -RED, and GREEN

Operation:

1. Initial (after reset) condition – green light on.
2. PB is pressed – RED light on, for 10 seconds.
3. After that, the circuit will reset itself, and green light goes on.

Question 4 (25%)

Implement the following IIR filter in DF-1:

$$H(z) = \frac{\sum_{n=0}^M b(n)z^{-n}}{1 + \sum_{n=1}^N a(n)z^{-n}} \quad M=3; N=3$$

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