AE 242 Aerospace Measurements Laboratory

End Semester Exam 30th April 2018 8:30-10:30 Marks 35 Roll Number 160010018

Instructions: 1) Use of mobile phone is strictly prohibited. 2) Sharing of calculators is not allowed

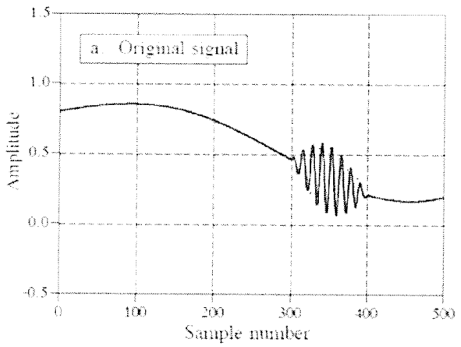
Q1) How many GPS satellites are required for position calculation? Derive receiver position estimation using pseudorange measurements in satellite navigation like GPS? (6)

Q2) How many sun sensors are required to determine orientation with respect to sun vector. Derive the expression for determination of orientation from sun sensor measurement. (3)

Q3) Explain how a pressure sensor connected by a tube is modeled when pressure variation is slow and fluid is heavily damped. (5)

Q4) Using block diagram of low pass filter and high pass filter create a) band pass filter b) band reject filter. (3)

Q5) Show the output when the given signal is passed through a) low pass filter b) high pass filter (1+1)



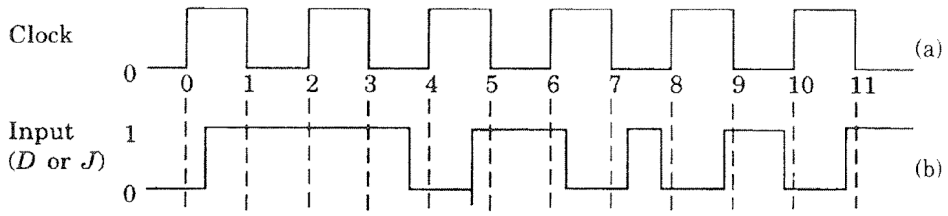
Q6) Fill the table for the recorded accelerometer output. Assume initial condition as zero. (6)

(Used Euler's Method)

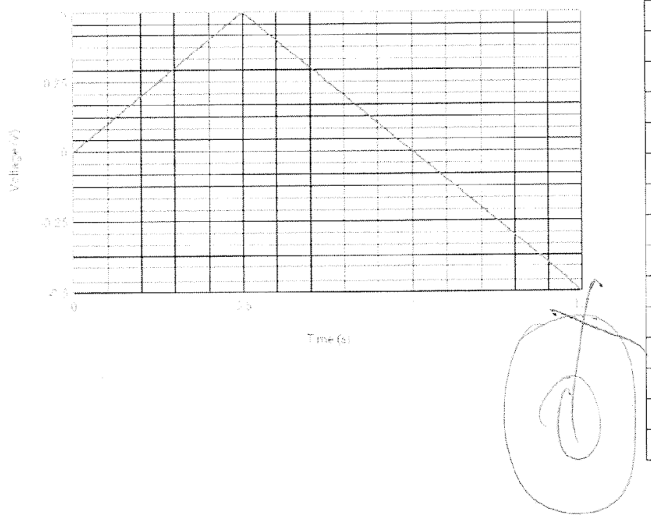
Time (sec)	Acceleration	Velocity	Distance
0	0	0	0
0.01	0.1	0	0
0.02	0.15	0.001	0
0.03	0.2	0.0025	1×10^{-5}

Q7) What was latitude and longitude recorded by you during the GPS experiment? (1)

Q8) Input and clock signal to a positive edge triggered D-Type flip-flop is shown below. Show the output of the flip flop. (5)



Q9) Figure given below shows a voltage changing with time. This voltage is given as input to a four channel analog to digital conversion device consisting of One multiplexer + One sample and hold + one ADC Draw the block diagram and give justification for your answer. (4)



Time	Voltage	ADC1	ADC2	ADC3	ADC4
0	0	0	0	0	0
0.1	0.1	0.1	0	0	0
0.2	0.2	0.2	0.1	0	0
0.3	0.3	0.3	0.2	0.1	0
0.4	0.4	0.4	0.3	0.2	0.1
0.5	0.5	0.5	0.4	0.3	0.2
0.6	0.4	0.4	0.5	0.4	0.3
0.7	0.3	0.3	0.4	0.5	0.4
0.8	0.2	0.2	0.3	0.4	0.5
0.9	0.1	0.1	0.2	0.3	0.4
1	0	0	0.1	0.2	0.3
1.1	-0.1	-0.1	0	0.1	0.2
1.2	-0.2	-0.2	-0.1	0	0.1
1.3	-0.3	-0.3	-0.2	-0.1	0
1.4	-0.4	-0.4	-0.3	-0.2	-0.1
1.5	-0.5	-0.5	-0.4	-0.3	-0.2

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