53 (IE 810) VINS

2018

VIRTUAL INSTRUMENTATION

Paper : IE 810

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Symbols have their usual significance.

Answer **any five** questions.

1. (a) What is Virtual Instrumentation ? Mention the advantages of Virtual Instrumentation. 6

   (b) Explain sampling theorem and aliasing effect. 4

   (c) Draw and explain the successive approximation type ADC or weighted resistor type 4-bit DAC. 10

2. (a) Write a VI program to convert degree Celsius to degree Fahrenheit and degree Fahrenheit to degree Celsius. 10

(b) What is Sub VI ? Explain how the Sub VI can be reused to solve the quadratic equations. 10

3. Pneumatically controlled valves are operated by changing the air pressure to a diaphragm, as illustrated in Fig#3. The pressure, acting on the area of the diaphragm, generates a force that attemps to move the valve stem :

$F_{Air} = PA$. That force is countered by a spring that pushes on the diaphragm in the other direction : $F_{Spring} = K_{Spring} x$ where

K_{Spring} is the spring constant and x is the extension of the spring. Control valve typically use air pressures ranging between 3 *psi* and 15 *psi*. The change in applied force because of the pressure change causes the valve step to move approximately 1 *inch*.
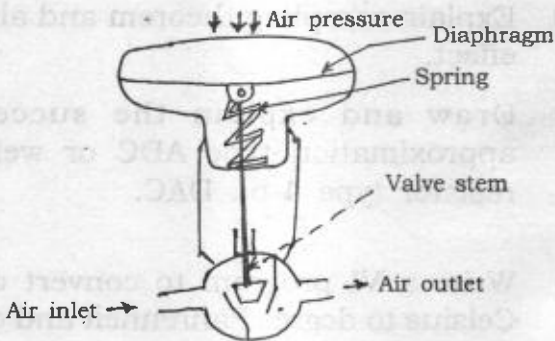
Fig#3

Determine

(a) The force applied to a 10 *inch* diameter diaphragm by 3 *psi* air.

(b) The force applied to a 10 *inch* diameter diaphragm by 15 *psi* air.

(c) The change in applied force (ΔF) as the air pressure increases from 3 to I5 *psi*.

(d) The spring constant required to cause the valve stem to move 1 *inch* in response to the calculated change in force.

Write the VI programs for the above problem.   20

4. *(a)* Explain the FOR Loop and WHILE Loop. Give *one* example for *each* case.   10

    (b) Write the VI programs to perform the determinant and transpose of a given matrix.   10

5. *(a)* What is data acquisition system (DAS) ? Explain the computer based DAS with a block diagram.   10

(b) Explain how DAS can be designed and developed using Labview. Mention at least *four* important parameters that to be set during VI program. 10

6. *(a)* What are the features of RS 485 and RS 422 ? 6

   (b) Mention and explain the different buses. 6

   (c) Explain in detail about the different USB standards. 8

7. *(a)* Write a VI program for BMI (Basic Metabolic Index) representation along with both digital & analog (by slide pointer) indication. Indicate the result in front panel for Mr. X having weight (W) = 180 *lb* and height (h) = 5 *ft*. 3 *in*. and also check whether Mr. X remains in NORMAL BMI range or NOT. If he is not in normal BMI range then what amount of weight is to be reduced gained for normal BMI.

   Assume : $BMI = \dfrac{4\cdot88 * M(lb)}{H^2\left(ft^2\right)}$,

   BMI = Underweight when BMI< 18·5. Normal weight when BMI=18·5 − 25. Overweight when BMI=25−30 and Obese when BMI>30.

   10

(b) Write a VI program to simulate a PID controller. 10

8. Write short notes *on **any four*** of the following : 4×5=20

(a) Auto indexing array

(b) CRIO and MyRIO devices

(c) R-2R type 4-bit DAC

(d) Role of range and resolution in DAS

(e) RS 232 and RS 422

(f) Array and clusters.

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(b) Write a VI program to simulate a PID controller. 10

8. Write short notes on any **four** of the following: 4×5=20

(a) Auto indexing array

(b) GPIO and MyRIO devices

(c) R-2R type 4-bit DAC

(d) Role of range and resolution in DAS

(e) RS 232 and RS 422

(f) Array and clusters.

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