

Duration: 03 Hrs.

Total Marks: 80

Note:

Q. No 1 is compulsory

Attempt any THREE questions from Q No 2 to Q No 6.

**Q.1) Attempt Any Five****20 M**

- Explain with an example split range control.
- Why Pneumatic instrumentation is preferred in processing plants?
- Explain Decay Ratio and its significance.
- Explain Proportional Band and Offset.
- Compare Self Tuning Regulator and MRAC
- A liquid level control system converts a displacement of 5m to 10m into a 4 to 20mA control signal. A relay serves as the two position controller to open or close an inlet valve. The relay closes at 12mA and opens at 10mA. Find neutral zone and displacement gap in metres.

**Q. No 2)**

- Explain with a neat sketch working of pneumatic PID controller. **10 M**
- A PI Controller indicates an output of 12mA when the error is zero. The set point is suddenly increased to 14mA and the controller output is recorded and is as given below: **10 M**

Time t, sec	0	10	20	30
Output in mA	14	16	18	20

Find Proportional gain and integral time.

**Q.No 3)**

- Explain why tuning is required. Explain Relay feedback approach of tuning. **10 M**



b. Consider a process with the following input-output relationships

10 M

$$y_1 = \frac{1}{s+1} m_1 + \frac{1}{0.1s+1} m_2$$

$$y_2 = \frac{-0.2}{0.5s+1} m_1 + \frac{0.8}{s+1} m_2$$

Compute Relative Gain Array.

Q. No 4)

a. What is Dead Time? Derive equation for dead time and also give its approximate model. Why dead time systems are difficult to control?

10 M

b. Prove integral action eliminates offset introduced by proportional action in PI Controller. Consider a first order process,  $G_m = G_f = 1$ ,  $G_d = 0$ .

10 M

Q. No 5)

a. Explain with suitable example both ratio control configurations.

10 M

b. Develop a ladder logic using physical ladder elements to maintain a neutral zone in a tank. Levels are measured using two level Switches LL (Low Level Switch) and LH (High Level Switch). Pump is made ON or OFF using this measurement. Truth Table is as given below: (bracket indicates actual status of switch)

10 M

LL Status	LH Status	Pump Status
Not Reached(0)	Not Reached(0)	Pump ON (1)
Reached (1)	Not Reached(0)	Pump ON (1)
Reached (1)	Reached (1)	Pump OFF (0)
Reached (1)	Not Reached(0)	Pump OFF (0)

System should start and stop only through two Push Buttons START(NO PB) and STOP(NC PB).

Q. No 6 Write Short Notes on (Any Four)

20 M

- Ziegler Nichol's Closed Loop Technique for tuning of controllers.
- Derivative controller and effect of PD Control on process.
- Interaction and Degrees of Freedom.
- Block diagram of MIMO system.
- Batch Process and its example.

[3 Hours]

[Total Marks: 80]

**NB.** Q.1 is Compulsory.

Solve any three questions from the remaining  
Assume suitable data if required and justify it.

- |            |  |    |
|------------|--|----|
| <b>Q.1</b> | Solve the following  | 20 |
|            | a) Explain UJT characteristics   |    |
|            | b) Write advantages of IGBT and MOSFET   |    |
|            | c) Explain need of synchronizing circuit in converters   |    |
|            | d) Draw the circuit of Jones Chopper and explain the commutation of main SCR   |    |
| <b>Q.2</b> | a) What is the difference between series and parallel inverter? Explain series inverter.   | 10 |
|            | b) Explain the current fed ac drives & state its applications  | 10 |
| <b>Q.3</b> | a) With the help of a neat diagram and associated waveforms discuss the operation of Buck-Boost converter. Also list the advantages and disadvantages of this type of converter. | 10 |
|            | b) Explain variable frequency I.M. drive   | 10 |
| <b>Q.4</b> | a) Describe the working of 1phase fully controlled bridge with RL load.  | 10 |
|            | b) Write a short note on reduction of harmonic distortion.   | 05 |
|            | c) Briefly explain the V-I characteristic of IGBT.   | 05 |
| <b>Q.5</b> | a) Explain the induction heating process with examples.  | 10 |
|            | b) Explain Step-up chopper with neat waveforms.  | 10 |
| <b>Q.6</b> | a) Draw the block diagram of brushless DC motor and explain it.  | 10 |
|            | b) State the significant features of traction drive  | 05 |
|            | c) Explain any one type of forced commutation  | 05 |

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Please check whether you have got the right question paper.

- N.B:
1. Question.No.1 is compulsory.
  2. Solve any three from remaining five question
  3. Assume suitable data if required.

Q1. Answer the following any four.

5x4=20

- a)  $y(n)-5y(n-1)+6y(n-2)=x(n)$  Determine system function & Impulse response
- b) Explain Block diagram of DSP
- c) Compute DFT of four point sequences  $x(n)=\{2,4,5,6\}$
- d) Write the condition of Hamming and hanning window techniques.
- e)  $H(s)=1/(s+3)(s+6)$  find  $H(z)$  using impulse invariance techniques

Q2. a) Prove the circular frequency shift and time shift properties of DFT

(10)

b) If  $x(n)=\{3,0,-2,0,2,1,0,-2,-1,0\}$  and  $h(n)=\{2,2,1\}$  perform overlap save method.

(10)

Q3. a) Find the 8 point DFT using DIT-FFT algorithm.

(10)

$X(n)=\{1,2,1,2,0,2,1,2\}$

b) Derive the relationship of DFT to F.T and Z.T

(10)

Q4. a) Realize the system using DF-II, cascade and parallel realization

(10)

$$H(z) = \frac{1 + \frac{1}{3} z^{-1}}{1 - \frac{3}{4} z^{-1} + \frac{1}{8} z^{-2}}$$

b) Obtain the magnitude and phase response of the following system

(10)

$H(n)=(-1/2)^n u(n)$

Q5. a) A low pass Butterworth filter has following specification

$0.8 \leq |H(e^{j\omega})| \leq 1$  for  $0 \leq \omega \leq 0.3 \pi$

$|H(e^{j\omega})| \leq 0.2$  for  $0.7 \pi \leq \omega \leq \pi$

Find the filter order and analog cut off frequency  $\Omega_0$  if

(i) Bilinear transformation techniques

(ii) Impulse invariance techniques.

(10)

b) Prove the derivation of FIR filter when

(i) N is even & symmetric

(ii) When N is odd and anti symmetric

(10)

Q6. a) Write a short note on Comb filter & notch filter.

b) Write a short note on Decimation by integer factor

c) Explain any one DSP processor in detail

(6+6+8)

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# Instrumentation / Sem-VI-(C BScs) / Application of Microcontroller-II / Dec-2017

Q.P. Code : 27819

[Time: 3 Hours]

[Marks: 80]

Please check whether you have got the right question paper.

- N.B:
1. Question No. 1 is compulsory.
  2. Attempt any 3 questions out of remaining questions.
  3. All questions carry equal marks.
  4. Assume suitable data is necessary.

1. Attempt following.

20

- a) Define embedded systems. Explain types of embedded systems and give example.
- b) Explain function of following registers.
  - a) BSR
  - b) FST
  - c) W
  - d) PC
- c) Explain following PIC 18 instructions.
  - a) BTFSC
  - b) TBLRD\*
- d) Draw and explain interfacing of serial EEPROM with PIC 18 in SPI mode.

2. a) Explain working of timer 1 of PIC 18 with prescaling feature in detail. 20
- b) Write PIC 18 program to receive byte of data serially and put term on PORTB. Set the baud rate at 9600. 20

3. a) Explain external interrupts of PIC 18 in detail. 10
- b) Explain ADC module of PIC 18 in detail. 10

4. a) Explain interfacing of DAC to PIC 18 and write a program to generate sawtooth waveform. 10
- b) Interface a seven segment LED to PIC 18 and write a program to display decimal counter (0 to 9) on it. 10

5. a) Interface D.C. motor to PIC 18. Write a program to rotate motor with 50% duty cycle using PWM mode of CCP module. 10
- b) What is priority inversion? Explain with suitable example. 10

6. Write short notes on any 4 20

- a) POPTB change interrupt
  - b) Interrupt latency
  - c) I<sup>2</sup>C module of PIC 18
  - d) Design challenges for embedded system
  - e) Memory organization of PIC 18
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Q. P. Code:-22960

(3 Hours)

Total Marks: 80

**Note:**

1. Question No.1 is compulsory
2. Solve any THREE questions out of remaining FIVE questions.
3. Figure to the right indicate full marks.

1 Attempt following.

[20]

- A. Explain hubs and routers.
- B. Compare RS 232 and RS 422
- C. Explain burst mode of HART protocol.
- D. Compare H1 and H2 segment of foundation field bus.
- E. Explain importance of data link layer in OSI model.

2. (a) Explain communication mode of HART protocol.

[10]

(b) Write detail information about Modbus.

[10]

3. (a) Explain Profibus-DP in detail.

[10]

(b) Explain CAN bus along with its application.

[10]

4. (a) Compare WIFI, GPS and GPRS.

[10]

(b) Explain TCP/IP protocol in detail

[10]

5. (a) Explain foundation field bus along with its advantages and disadvantages.

[10]

(b) Explain manchester coding?

[10]

6. Write a short note on:

1. Zigbee

[06]

2. LON

[07]

3. Data highway plus

[07]

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QP Code : 26386

[3 Hours]

[Total Marks : 80]

Please check whether you have got the right question paper

- N.B :**
1. Question No. 1 is compulsory.
  2. Attempt any three questions from the remaining five questions.
  3. Figures to the right indicate full marks.

1. Answer the following : 20
  - (a) Explain interference filters used in absorption instruments.
  - (b) State the advantages of solid state detectors.
  - (c) Sketch a typical NMR spectrum.
  - (d) Give the list of sample handling systems in mass spectrometry.
2.
  - (a) State and prove Beer Lamberts law. 10
  - (b) Explain the different types of monochromators used in absorption instruments. 10
3.
  - (a) Explain the principle of ESR spectrometer and compare with NMR spectrometer. 10
  - (b) What is meant by Raman effect ? What are the properties of Raman lines ? 10
4.
  - (a) Explain 'Time of flight' mass spectrometer with neat diagram. 10
  - (b) With a neat schematic diagram explain the working of (Geiger Mueller) GM counter. 10
5.
  - (a) With a neat block diagram explain an atomic absorption spectrophotometer. 10
  - (b) What is chromatograph ? Explain the construction and working of Gas chromatograph. 10
6. Write short note on any two :- 20
  - (a) X-ray spectrometer
  - (b) Double beam densitometer
  - (c) Gas density analyser
  - (d) Oxygen analyser.