

(3 Hours)

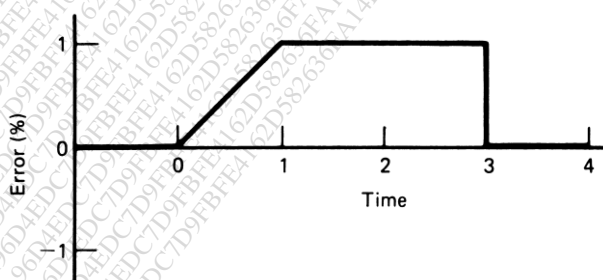
[Total Marks: 80]

- N.B:
- (1) Question No.1 is **compulsory**.
  - (2) Answer any **three** questions from Question Nos. 2 to 6.
  - (3) Assume suitable data if necessary.

- 1 Answer any FIVE of the following questions:- 20
- (a) Explain the evolution of automatic process control. 4
  - (b) In the temperature measurement system, suppose the temperature range  $20^{\circ}$  to  $120^{\circ}$  C is linearly converted to the standard current range of 4 to 20 mA. What current will result from  $60^{\circ}$  C ? What temperature does 6.5 mA represent? 4
  - (c) What is significance of integral action? Explain the effect of Derivative action. 4
  - (d) Explain of Cascade controller. 4
  - (e) What is the use of RGA? Explain its properties. 4
  - (f) Explain discrete state process control. 4

- 2 (a) Explain the dead time and inverse response compensator. 10
- (b) For the error curve shown below, plot a graph of a proportional-integral controller output as a function of time. 10

$$K_p = 5, \quad K_i = 1.0 \text{ s}^{-1}, \text{ and } p_i(0) = 20 \%$$



- 3 (a) Discuss the advantages and disadvantages of F/B and F/F controller. 10
- (b) With example explain ratio control scheme. 10

- 4 (a) With example explain the process characteristics. 10  
(b) Draw and explain the working of electronic PID controller. 10
- 5 (a) Discuss the modes of controller. 10  
(b) Draw and explain the block diagram analysis of multivariable systems. 10
- 6 Write short note on (any TWO):- 20  
(a) Relay based tuning.  
(b) Selective control scheme  
(c) Compare Batch and Continues process.  
(d) MRAC.

[3 Hours]

[Total Marks: 80]

- N.B.
1. Question no.1 is compulsory.
  2. Solve **any three** from the remaining.
  3. Assume data wherever necessary.

1. Solve the following questions. [20]
  - a) Explain V-I characteristics of SCR.
  - b) Compare MOSFET, IGBT and SCR
  - c) Explain Asymmetric semi converter.
  - d) Draw and explain the circuit of Buck Boost converter
  
2. a) A work piece of dielectric material with size 25cmX1cm (thick) is to be heated using 1000W heating power. If relative permittivity of the material is 4 and power factor is 0.06. Determine the voltage and current necessary at frequency of 40Hz. [10]
  - b) Explain UJT operation with its waveforms. [10]
  
3. With the help of a neat diagram and associated waveforms
  - a) Discuss the operation of Type C commutation circuit. [10]
  - b) Explain the current fed ac drives & state its applications [10]
  
4. a) Explain difference bet PT and NPT IGBT. [10]
  - b) Explain the working of AC regulator to control the speed of a Fan. [10]
  
5. a) Explain Step up-down chopper. [10]
  - b) Draw neat waveforms of PWM method in inverter and describe [10]
  
6. a) Explain the brushless DC motor its applications. [10]
  - b) Explain parallel inverter with waveforms. [10]

Duration: 3 Hours

Total Marks Assigned: 80

Note:

1. Question one is compulsory.

2. Solve any three from remaining and assume suitable data

**Q1. Solve any four****20**

- Find the DFT of following sequence  
 $X(n) = \{1, 1, 2, 2\}$
- State and explain the Aliasing effect for signal.
- An analog filter has transfer function, determine transfer function of digital filter using impulse invariance transformation, sampling time  $T=0.01$ sec.

$$H(s) = \frac{1}{(s+1)(s+3)}$$

- Solve the following z-transform Using convolution property

$$h(n) = \{1, 2, 3, 4\}, y(n) = \{5, 16, 28, 24\}$$

- Explain in Notch filter in detail.

**Q2. a** Find the 8 point DFT using DIT-FFT algorithm**10**

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

**Q2. b** Find out the cascade and parallel realization of**10**

$$y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$$

**Q3.a** Find the DFT  $x(n) = \{4+5j, 3+6j, 3+4j, 2+2j\}$  otherwise find DFT of**10**

$$x_1(n) = \{4, 3, 3, 2\}, X_2(n) = \{5, 6, 4, 2\}, X_3(n) = \{9, 9, 7, 4\}.$$

**Q3.b.** The system with following equation finds the magnitude and phase response and comment on filter type.**10**

$$Y(n) = 0.9y(n-1) + 6x(n)$$

**Q4.a.** compute circular convolution using DFT and IDFT**10**

$$X_1(n) = \{2, 3, 1, 1\}$$

$$X_2(n) = \{1, 3, 5, 3\}$$

**Q4.b.** Design a digital LPF for following specification**10**

Cutoff frequency = 500Hz

Sampling frequency = 2000Hz

Order of filter = 10.

Using hanning window.

**Q5.a.** A low pass butterworth filter has following specification, Find out filter order and cutoff frequency using bilinear transformation technique . **10**

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

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

**Q5.b.** Using overlap and save method find linear convolution **10**

$$X(n) = \{1, 1, 2, -1, 2, -3, -1, 1, 2, 1, -3, -1\}$$

$$H(n) = \{1, 2\}$$

**Q6a.** Explain any one application of DSP **04**

**Q6b** Write short note on Decimation by integer factor **06**

**Q6c** Explain any four properties of DFT in details **10**

N.B.:

- 1) Question no.1 is compulsory.
- 2) Attempt any three questions out of remaining five questions.
- 3) Assume suitable data if necessary.

- 1 Solve following 20
  - a Write down design challenges of Embedded system
  - b Explain PORT B change interrupt of PIC 18.
  - c Explain priority inversion with example.
  - d What are the different sources of interrupts in the PIC18.
- 2
  - a Explain programming logic for converting HEX data to BCD. 10  
Write a program to convert 1 byte hex data to BCD.
  - b Interface LED to PIC18F. Write a program to blink LED with 10  
0.5 sec on and 1sec off continuously. Use timer0 for delay  
generation. Assume Fosc=2Mhz and use maximum prescaler  
allowed.
- 3
  - a Explain PIC18F serial port. Write a program to send letter 10  
“INSTRU” continuously on serial port at 9600 baud. Assume  
crystal frequency is 8 Mhz.
  - b What are the features of ADC module of PIC18. Write a program 10  
to get data from channel display the result on PORTC and  
PORTB.
- 4
  - a What is task ? Explain various task scheduling algorithms. 10
  - b Interface four seven segment LED's to PIC18, Write a program 10  
in assembly or C language to display ‘ABCD’ on Them.
- 5
  - a Design battery monitoring system using PIC18F4520 with 10  
following specifications  
Battery – 12 V/7AH, indication - Charged (LED), Drained  
(LED). When battery voltage is bellow 10V, Drained LED  
should be ON, When Battery voltage above 12V or charging  
supply is connected, Charge LED should be on.

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- b Interface 16x2 LCD to PIC18F. Explain function of RS and E 10 pin with the help of timing diagram. Write a program to display INSTRUMENTATION on it.
- 6 Solve any two. 20
- a Memory organization of PIC18F.
- b Port A structure of PIC18F4520
- c Explain operation of timer0 of PIC18F microcontroller with block diagram.

PIC18F4520 SFRS

Reg. Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
INTCON	GIE/GIH	PEIE/GIEL	TMR0IE	INT0IE	PBIE	TMR0IF	INT0IF	RBIF
INTCON2	RBPU	INTEDG0	INTEDG1	INTEDG2	-----	TMR0IP	-----	RBIP
INTCON3	INT2IP	INT1IP	-----	INT2IE	INT1IE	-----	INT2IF	INT1IF
T0CON	TMR0ON	T08BIT	T0CS	T0SE	PSA	T0PS2	T0PS1	T0PS0
T1CON	RD16	T1RUN	T1CKPS1	T1CKPS0	T1OSCEN	T1SYNC	TMR1CS	TMR1ON
T2CON	---	T2OUTPS3	T2OUTPS2	T2OUTPS1	T2OUTPS0	TMR2ON	T2CKPS1	T2CKPS0
ADCON0	---	---	CHS3	CHS2	CHS1	CHS0	GO/DONE	ADON
ADCON1	---	---	VCFG1	VCFG0	PCFG3	PCFG2	PCFG1	PCFG0
ADCON2	ADFM	---	ACQT2	ACQT1	ACQT0	ADCS2	ADCS1	ADCS0
TXSTA	CSRC	TX9	TXEN	SYNC	SEnDB	BRGH	TRMT	TX9D
RCSTA	SPEN	RX9	SREN	CREN	ADDEN	FERR	OERR	RX9D
IPR1	PSPIF	ADIF	RCIF	TXIF	SSPIF	CCP1IF	TMR2IF	TMR1IF
IPR2	OSCFIF	CMIF	---	EEIF	BCLIF	HLVDIF	TMR3IF	CCP2IF
PIE1	PSPIE	ADIE	RCIE	TXIE	SSPIE	CCP1IE	TMR2IE	TMR1IE
PIE2	OSCFIE	CMIE	---	EEIE	BCLIE	HLVDIE	TMR3IE	CCP2IE
PIR1	PSPIP(1)	ADIP	RCIP	TXIP	SSPIP	CCP1IP	TMR2IP	TMR1IP
PIR2	OSCFIP	CMIP	---	EEIP	BCLIP	HLVDIP	TMR3IP	CCP2IP

[Time: Three Hours]

[ Marks:80]

- N.B:
1. Question.No.1 is compulsory.
  2. Attempt any three questions from remaining five questions.
  3. Assume suitable data wherever necessary.

Q1 Answer the following 20

- a) Mention which layer of OSI model following devices operates in: Repeater, switch, Hub, Bridge, Router. Also discuss functionality of each device.
- b) Compare the features of RS232, RS422 and RS 485.
- c) Compare H1 and HSE Foundation field bus segments.
- d) What are different modes of communication in HART. Explain burst mode of communication.

Q2 a) Sketch OSI reference model along with explanation of each layer. 10

- b) Compare open network MODBUS and propriety network MODBUS plus, along with the explanation for both. 10

Q3 a) Explain architecture of CAN protocol. 10

- b) Which different layers of OSI model does Profibus-PA work on? Discuss numerous features as well. 10

Q4 a) Explain layered architecture of HART. Also discuss various HART commands. 10

- b) Compare Wi-Fi, ZigBee, GPRS and Bluetooth modes of wireless communication 10

Q5 a) What different components are used in Foundation Fieldbus and how are they used? 10

- b) Explain the architecture of foundation field bus. 10

Q6 Write short note (Any three) 20

- a) GPIB
- b) HART troubleshooting
- c) OPC architecture
- d) Wireless LAN



Time: 3 Hours

Marks-80

**N: B: 1) Question No.1 is Compulsory.**

**2) Attempt any three questions out of remaining five questions.**

**3) Illustrate Answers with sketches wherever required.**

- Q. No.1. Answer the following 20
- Draw the general block diagram of analytical instrument and explain.
  - Sketch a typical NMR Spectrum.
  - Discuss the salient features of Scintillation counter.
  - Give the list of sample handling systems in mass spectrometry.
  - Explain the principle of oxygen analyzer.
- Q. No. 2
- State Beer & Lamberts laws of photometry and derive the expression  $A = abc$  10
  - What are the types of filters used on absorption spectrometers? Explain with suitable Diagrams. 10
- Q. No. 3
- Explain the principle of ESR Compare it with NMR. Draw and explain ESR Spectrometer. 10
  - What is a difference between atomic absorption and atomic emission spectroscopy? 10
- Q. No. 4
- Explain with neat schematic diagram Quadrapole mass spectrometer. 10
  - Explain with a schematic diagram the operation of a double beam UV-VIS Spectrometer. 10
- Q. No. 5
- Give Classification of chromatograph. List the parts of GC. Draw & explain the working of GC. 10
  - With neat diagram explain proportional counter. 10
- Que.6. Write short notes on :- 20
- X-ray spectrometer
  - GC-MS
  - GM Counter