QP Code : 597902

(3 Hours)   [Total Marks : 80

N.B.: (1) Question **No.1** is **compulsory**.
(2)   From **Q. No. 2 to Q. No. 6.** Solve any **three.**
(3) Assume suitable data wherever necessary.

1. Answer any **four**   20
    a) Explain Auctioneering control using an Example.
    b) Why derivative control is not used alone?
    c) What is Dead time. Derive an equation for dead time.
    d) Compare Batch process and continuous process.
    e) Draw symbols for physical ladder elements for Temperature switch, pressure switch, level switch & push buttons.

2. a) What are the objectives of Adaptive control. Explain Self Tuning Regulator.   10
    b) Explain Ziegler-Nichols Closed loop technique for tuning of controllers.   5
    c) In an application of Z-N method a process begins oscillation with 30%   5
        Proportional Band in an 11.5min period. Find nominal PID controller settings.

3. a) Explain Electronic PID controller with neat Diagram.   10
    b) A 5-m diameter cylindrical tank is emptied by a constant outflow of $1.0 m^3$/ 10
        min. An on-off controller is used to open and close a fill value with an open flow of $2.0 m^3$/min. For level control, the neutral zone is 1m and the setpoint is 12m.
        i) Calculate the cycling period.
        ii) Plot level versus time.

4. a) Explain Relay based Tuning Technique. What are the advantages over Cohen-   10
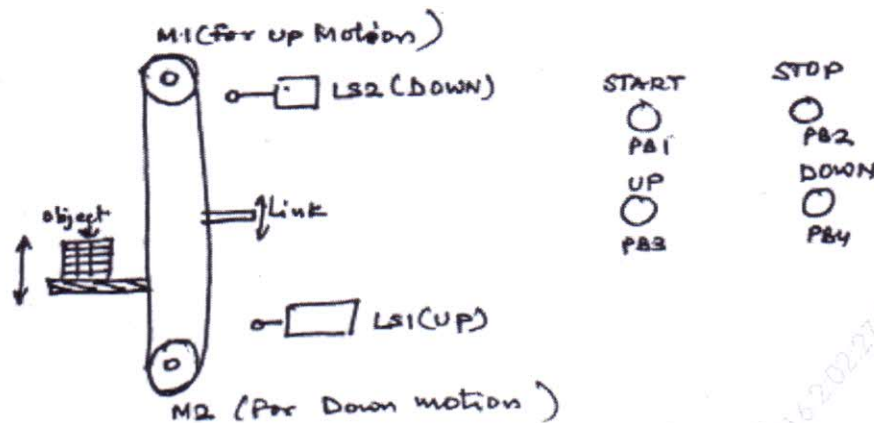   Coon Technique.
    b) Explain with an example What is interaction? Explain Decoupling method   10
   used in multivariable control.

[**TURN OVER**

5. a)

The Elevator shown in figure above employs a platform to move objects up and down. The obejctive is when UP Button (PB3) is pushed, the platforms carries object to the up position upto LSI (Link on other Side of object touches LSI) Similarly when Down button (PB4) is pushed, the platform carries object down till LS2. M1 and M2 are separate motors used for this operation Process should start only when START Button is pressed and should stop when STOP Button is pressed.

10

b) Explain feed forward control in detail. Derive equation for controller in feed forward control system. Also draw feed forward control system for Stirred Tank Heater (STH) system.

10

6. a)
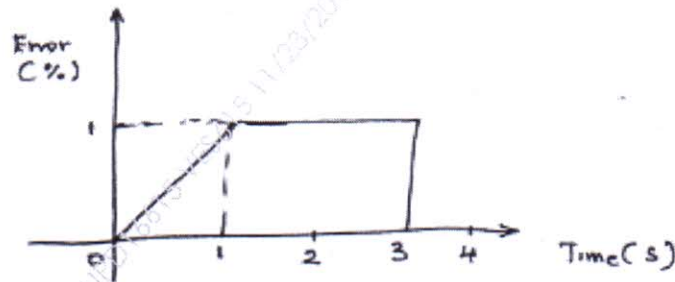
Assume $K_p = 5$, $K_I = 1.0s^{-1}$ and $P_I(0) = 20\%$ Plot the graph of P + I controller output as function of Time.

10

b) Prove that Integral Action Changes the order of closed loop system.(Consider only setpoint change problem)

Assume $G_P = \dfrac{K_P}{\tau_p s + 1}$, $G_f = G_m = 1$, controller P + I. $G_d = 0$

10

QP CODE : 598003

[3 Hours]   [Total Marks: 80]

N.B. : 1. **Question 1** is **compulsory**.
2. Solve **any three** from remaining.
3. Assume suitable data if required and justify it.

Q.1)   Attempt any four   [20]
1) Explain Punch through IGBT
2) Explain class C commutation circuit
3) Write short notes on reduction of harmonic distortion.
4) List out advantage and disadvantages of series inverter and parallel inverter.
5) Explain Type B chopper

Q.2)   Design an AC power circuit using TRIAC and phase shift   [20]
network. Input 230 V, 50 Hz, 1ϕ-AC load 50Ω.
Output required is 50% to 100%variable power.

Q.3)   a) Explain variable AC induction motor drive.   [10]
b) Explain basic principle of Dielectric heating. List its   [10]
advantages and applications.

Q.4)   a) Explain fan regulator using diac triac scheme.   [10]
b) Explain snubber circuit with neat waveforms.   [10]

Q.5)   a) Explain Boost regulator with the help of circuit diagram. [10]
b) Explain the second breakdown in Power BJT   [10]

Q.6)   a) Explain symmetric semiconverter.   [10]
b) Explain circuit diagram of full bridge inverter with FW diode.   [10]

(3 Hours) | Total Marks : 80

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 **any four** :-
   (a) Draw and explain block diagram of DSP processor.   20
   (b) Determine the inverse DFT by using DITFFT
       $x(k) = [6, -1-j \ \ 0 \ -1 + j]$
   (c) Compare between DFT and IDFT in no. of computations.
   (d) Draw the pole zero plot for all pass filters also write its difference equation.
   (e) Convert the analog Filter into digital filter by means of BLT where the resanant frequency $\omega r = \pi/2$

   $$H(s) = \frac{(s+0.1)}{(s+0.1)^2 + 9}$$

2. (a) Find 8 point DFT of the given sequence using DIT FFT algorithm.
       $x(n) = 2^n \ \ 0 \leq n \leq 7$ 10

   (b) Perform the linear convolution of the following sequences using overlap save method.   10
       $x(n) = \{ 2, 1, -3, 4, -1, -2, 0, 1, 2, 4 \}$
       $h(n) = \{ 5, 1, 2 \}$

3. (a) One of the zeros of the causal FIR Filter lies at $z = 1/2$. Find the location of other zeros if the system is symmetric and even length. Find the transfer function and its impulse response.   10

   (b) Obtain Linear Phase realization of following transfer function.   10
       $H(z) = (1 + \frac{1}{2} z^{-1} + z^{-2}) (1 + \frac{1}{4} z^{-1} + z^{-2})$

   (c) Find the DFT of following sequences by using DFT only ones not otherwise
       $x(n) = [7, 3, 2, 1] \qquad h(n) = [4, 6, 1, 5,]$ 10

4. (a) Realize the system using Direct Form - II, cascade and parallel.   10
       $y(n) = -0.1y(n - 1) + 0.2y(n - 2) + 3x(n) + 3.6x(n - 1) + 0.6 x(n - 2)$

[TURN OVER]

(b) Design IIR butterworth filter to satisfy the following condition using Impulse invariance method Assume $T = 1$ sec.   **10**

$$0.8 < |H(e^{j\omega})| \leq 1 \qquad \text{for } 0 \leq \omega \leq 0.1\pi$$
$$|H(e^{j\omega})| \leq 0.2 \qquad \text{for } 0.6\pi \leq \omega \leq \pi$$

5. (a) Determine the frequency response. Plot magnetude and phase response for frequency.   **10**

$$\omega = 0, \pi/4, \ \pi/2, \ 3\pi/4 \ \& \ \pi$$
$$y(n) = x(n) + 0.9 \, x(n-2) - 0.4 y(n-2)$$

(b) A Linear phase FIR filter has desired response.   **10**

$$Hd(e^{j\omega}) = 0 \qquad \text{for } -\pi/4 \leq \omega \leq \pi/4$$
$$= e^{-j2\omega} \qquad \text{for } \pi/4 \leq |\omega| \leq \pi$$

Design the filter using Hamming window also Draw linear Phase realization.

6. (a) Derive the DIT FFT algorithm for $N = 6 = 2.3$.   **10**

(b) Write a short note on Interpalation.   **5**

(c) Write a difference between IIR and FIR filter.   **5**

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(3 Hours)   [Total Marks:80

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.   Answer any five in brief   20
  a.   Define embedded system. Explain various characteristics of embedded system
  b.   Interface one 7-segment LED display to PIC18F4520 and write instructions/program to display '8' on it.
  c.   Explain following instructions with example
       i.   DECFST   ii. BTFSS
  d.   Explain features of IIC protocol
  e.   Explain design challenges in embedded systems
  f.   With suitable example explain priority inversion

2. a.   Draw and explain programming model of PIC18F4520.   10
   b.   Write a program to convert HEX number to decimal number   10
        using PIC18F assembly language or C programming. Explain program logic in detail with example.

3. a.   Assume that XTAL=10MHz, write a program to generate a   10
        square wave of 50Hz frequency on PORTB.0. Use timer1 in 16bit mode with maximum presalar allowed.
   b.   Write a program for PIC18 to transfer the letter 'A' serially at 9600 baud continuously. Assume XTAL=8Mhz
4. a.   Interface 4x4 matrix keys to PIC18F and write a program to 10
        identify which key is pressed. Send detected key on PORTD.
   b.   What is task? Explain various task scheduling algorithms.   10

                                             [Turn Over

5. a. Interface 8 bit DAC tp PIC18F and write a program to generate sine waveform.   10

   b. Explain SPI module of PIC18F4520. Interface serial EEPROM with PIC18F using SPI module.   10

6. Write short note on any two   20
   a. ADC module of PIC18F
   b. Compare modes of CCP module
   c. Memory organization of PIC18F.

PIC 18f4520 SFRS

Reg. Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
INTCON	GIE/GIH	PEIE/GIEL	TMR0IE	INT0IE	RBIE	TMR0IF	INT0IF	RBIF
INTCON2	RBPU	INTEDG0	INTEDR1	INTEDG2		TMR0IP		RBIP
INTCON3	INT2IP	INT1IP		INT2IE	INT1IE		INT2IF	INT1IF
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	NDB	ACQT0	ADCS2	DACS1	ADCS0
TXSTA	CSRC	TX9	TXEN	SYNC	SENDB	BRGH	TRMT	TX9D
RCSTA	SPEN	RX9	SREN	CREN	ADDEN	FERR	OERR	TX9D
IPR1	PSPIP	ADIP	RCIP	TXIP	SSPIP	CCP1IP	TMR2IP	TMR1IP
IPR2	OSCFIP	CMIF	--------	EEIF	BCLIP	HLVDIP	TMR3IP	CCP2IP
PIE1	PSPIE	ADIE	RCIE	TXIE	SSPIE	CCP1IE	TMR2IE	TMR1IE
PIE2	OSCFIE	CMIE	-------	EEIE	BCLIE	HLVDIE	TMR3IE	CCP2IE
PIR1	PSPIF	ADIF	RCIF	TXIF	SSPIF	CCP1IF	TMR2IF	TMR1IF
PIR2	OSCFIF	CMIF	-------	EEIF	BCLIF	HLVDIF	TMR3IF	CCP2IF

ANALYTICAL INST.

Q.P. Code : 598404

(3 hours)   **Marks : 80**

Note : 1) Question No. **1** is **compulsory.**
　　　　2) Attempt **any 3** questions from remaining 5 questions.

1. Answer **any 05** out of the **06** questions given below:　　　　20
   a) Differentiate between Fluorescence and Phosphorescence spectroscopy.
   b) Explain in brief, Prism monochromator used in absorption instruments.
   c) Define chemical shift and explain its significance in NMR spectrometry.
   d) Write short notes on, Scintillation counter.
   e) Explain Resolution in Mass spectrometry.
   f) Explain in brief, working of Lamp regulator system used in spectrometers.

2. a. State and derive Beer-Lambert's law and Justify it as a limiting law.　　10
   b. Explain with diagram, the working of Single beam UV-VIS Spectrophotometer.　10

3. a. Explain Raman Effect. With neat diagram, explain working of Raman　　10
      spectrometer and give properties of Raman lines.
   b. Explain the principle and concept of Atomic Absorption Spectrometer with　10
      neat diagram.

4. a. Explain the working of Nuclear magnetic Resonance (NMR) spectrometer　10
      with Suitable diagram.
   b. Explain with a neat diagram, working of Time-of-Flight Mass spectrometer.　10

5. a. What are the different types of detectors used in Gas Chromatography. Explain　10
      Any one detector in detail.
   b. Explain with a neat diagram, the working of Geiger Muller counter.　　10

6. Write short notes on (any two):　　　　20
   a. IR spectroscopy
   b. Gas density analyzer
   c. X-ray absorption meters