

QP Code : 597900

(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.

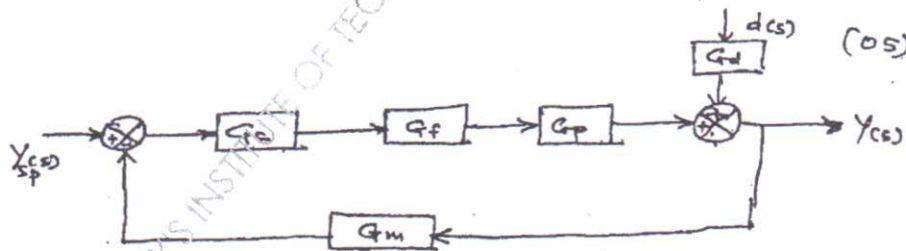
1. Answer any four:-

20

- Explain Gain margin and phase margin.
- Compare Batch process and continuous process.
- Explain Reset windup and its significance.
- Explain Override control with an example.
- Explain smith predictor compensator.

- Explain Z-N method for closed loop system for tuning of controllers. 5
- In an application of Z-N method a process begins oscillation with 30% proportional Band in an 11.5 min. period. Find nominal PID controller settings. 5
- Explain Electronic PID controller with neat diagram. 10

- What is setpoint tracking and disturbance Rejection. Explain with an example 5
- 5



Find equation for $Y(s)$ in terms of $Y_{sp}(s)$ and $d(s)$

- Explain Relay based tuning technique. What are the advantages over Cohen-Coon technique. 10

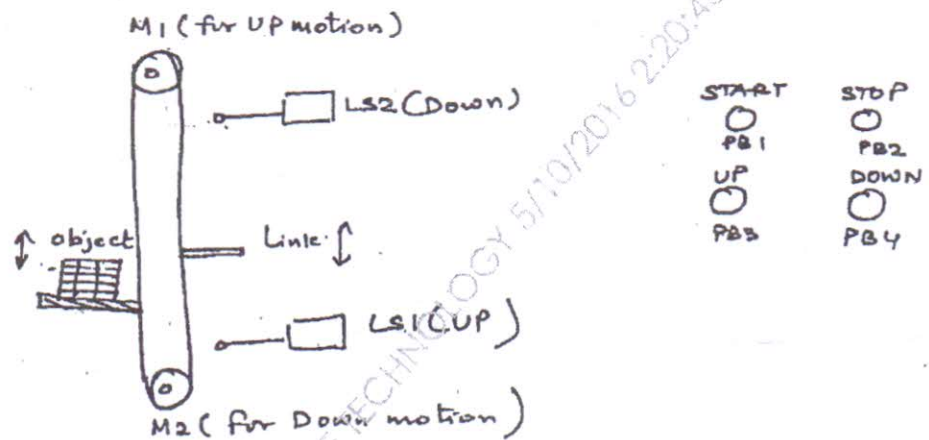
- Explain with an example, What is Interaction? Explain decoupling method used in multivariable control. 10
- What are the objectives of Adaptive control. Explain Self Tuning Regulator. 10

[TURN OVER

5. (a) Explain feed forward control in detail. Also find equation of controller. Draw feed forward control system for Stirred Tank Heater system. 10
- (b) A 5-m diameter cylindrical tank is emptied by a constant outflow of $1.0 \text{ m}^3/\text{min}$. An on off controller is used to open and close a fill valve with an open flow of $2.0 \text{ m}^3/\text{min}$ for level control, the Neutral zone is 1m and setpoint is 12m. 10
- (i) Calculate cycling period
- (ii) Plot level versus time

6. (a)

10



The Elevator shown in figure above employs a platform to move objects up and down. The objective is when 'UP' Button (PB3) is pushed the platform carries object to the up position upto LSI (Link on other side of object touches LSI), similarly when DOWN Button is pressed (PB4), the platform carries object down til LS2. M1 and M2 are separate motors used for this operation. Process starts with START (PB1) pressed and stops with STOP (PB2) pressed.

- (b) Explain Inverse response. Also give one example.

10

N.B. : (1) Question No. 1 is compulsory.
(2) Solve any three from the remaining.

1. (a) Define delay time, rise time & spread time referred to SCR. 20
(b) Explain the effect of source inductance on fully controlled bridge rectifier.
(c) How are inverters classified?
(d) Explain basic block diagram of SMPS.
(e) Explain how choice of a drive can be made.
 2. Design AC power control circuit using TRIAC & DIAC for following requirements. 20
Input voltage = 250V ac, 50 Hz, 1 phase
Output voltage variation = 150 to 200 V
Load resistance = 300Ω
 3. (a) Explain Buck-Boost converter. Derive expression for output voltage. 10
(b) Explain variable frequency control drive for AC motors. 10
 4. (a) What are dv/dt & di/dt rating of SCR? What happens if these ratings are exceeded? Explain. 10
(b) Explain applications of power electronics in electric heating. 10
 5. (a) Compare MOSFET, IGBT & SCR. 10
(b) Explain PWM full bridge inverter. 10
 6. (a) Explain different triggering methods of SCR. Also write their advantages & disadvantages. 10
(b) Write short note on. 10
 - 1) Series inverter
 - 2) Step up & step down chopper
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QP Code : 598101

(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 the following (Any four) :-

20

(a) $H(z) = \frac{5z^2 - 12z}{z^2 - 6z + 8}$ show that $h(n) = 2^n + 4^{n+1}$ and find first 5 vaccies.

(b) What are the advantage of DSP & define sampling theorem.

(c) Determine IDFT of $x(k) = \{ 3, 2+j, 1, 2-j \}$ by using DIF FFT algorithm.

(d) Convert the anlaog filter with system function $H(s) = \frac{(s + 0.1)}{(s + 0.1)^2 + 16}$ into a digital IIR filter using Bilinear transformation. The resanant frequency of $\omega_r = \pi/2$. 10

(e) Write a short note on Decimation by a integer factor. 10

2. (a) If $x(n) = \{ 2, 3, 4, 5 \}$ find (i) DFT of $x(k)$ (ii) using result obtained in one not otherwise find the DFT of following sequences. 10

$$x_1(n) = \{ 5, 2, 3, 4 \}, x_2(n) = \{ 3, 4, 5, 2 \}$$

$$[4, 5, 2, 3] \quad x_3 = [2, 5, 4, 3]$$

(b) Perform Linear convolution using DIT FFT algorithm. 10

$$x(n) = \{ 1, 2, 3 \} \quad h(n) = [1, 2]$$

3. (a) Determine the output of a Lirear FIR & whose impuse response 10

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

$$x(n) = \{ 3, 0, -2, 0, 2, 1, 0, -2, -1, 0 \}$$
 using over lap save method.

(b) Derive & draw the FFT for $N = 6 = 2 \times 3$ using DIT FFT algorithm. 10

4. (a) Determine the frequency response plot magnitude & phase response for the frequency $\omega = 0, \pi/4, \pi/2, 3\pi/4, \& \pi$. 10

$$y(n) = x(n) + 0.9 x(n - 2) - 0.4 y(n - 2)$$

[TURN OVER]

- (b) Realize the system by using, direct form - I cascade & parallel Realization. 10
 $y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$
5. (a) Design IIR butter worth filter to satisfy following condition. 10
 $0.8 < |H(e^{j\omega})| \leq 1$ for $0 \leq \omega \leq 0.2\pi$
 $|H(e^{j\omega})| \leq 0.2$ for $0.6\pi \leq \omega \leq \pi$
 using Bilinear transformation method Assume $T = 1\text{sec}$.
- (b) A Linear phase FIR filter has derived 10
 $H_a(e^{j\omega}) = 0$ for $-\pi/4 \leq \omega \leq \pi/4$
 $= e^{-j2\omega}$ for $\pi/4 \leq |\omega| < \pi$
 Design the filter using Hanning window Assume $M = 5$ and also draw Linear phase Realization.
6. (a) Explain the Architecture of Tex as - 320 DSP processor. 10
- (b) Write a short note on Interpolation. 5
- (c) Difference between IIR & FIR filter. 5

(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 following. 20
 - a. Explain characteristics of embedded systems
 - 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. BTFS
 - d. With suitable example explain priority inversion
 - e. Explain PORTB change interrupt of PIC18F.
2. a. Draw and explain programming model of PIC18F4520. 10
b. Write a program to convert HEX number to decimal number using PIC18F assembly language or C programming. 10
Explain program logic in detail with example.
3. a. Interface 16x2 LCD module to PIC18. Write a program to display "INSTRU" on first line and "ENGINEERING" on second line 10
b. Write a program for PIC18 to transfer the string 'INSTRU' serially at 9600 baud continuously. Assume XTAL=8Mhz
4. a. Interface 8 keys and one 7-segment display to PIC18. Write a program to display key number which is pressed. If no key is pressed display '0'. 10
b. What is task? Explain various task scheduling algorithms. 10

[Turn Over]

5. a. Explain onchip ADC module of PIC18F4520. Write a program to convert analog signal at AN0 and out it on PORTB and PORTD. 10
- b. Explain block diagram of temperature measurement / control system using PIC18F4520. Explain program flowchart. 10
6. Write short note on any two 20
- a. Development tools for PIC18F4520. Explain role of each tool in PIC18F based project.
- b. On- chip ECCP module of PIC18F4520. Explain PWM mode in detail.
- c. Memory organization of PIC18F.

PIC 18f4520 SFRS

Reg. Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
INTCON	GIE/GIH	PEIE/GIEL	TMROIE	INTOIE	RBIE	TMR0IF	INTOIF	RBIF
INTCON2	RBPUI	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	PSP1P	AD1P	RC1P	TX1P	SS1P	CCP11P	TMR21P	TMR11P
IPR2	OSCF1P	CM1P	---	EE1F	BCL1P	HLVD1P	TMR31P	CCP21P
PIE1	PSP1E	AD1E	RC1E	TX1E	SS1E	CCP11E	TMR21E	TMR11E
PIE2	OSCF1E	CM1E	---	EE1E	BCL1E	HLVD1E	TMR31E	CCP21E
PIR1	PSP1F	AD1F	RC1F	TX1F	SS1F	CCP11F	TMR21F	TMR11F
PIR2	OSCF1F	CM1F	---	EE1F	BCL1F	HLVD1F	TMR31F	CCP21F

(3 Hours)

[Total Marks : 80]

Note: Question 1 is compulsory

Solve any three out of remaining five questions

Figures on right indicate full marks allotted to main question

Q1 Answer the following

20Mks

- a. What are different types of network topologies?
- b. Explain Burst mode of communication of HART.
- c. Which layer is responsible for following-
 - I. Physical encoding and decoding
 - II. Providing end to end delivery of packets
 - III. Providing end to end delivery of segments
 - IV. Error detection and correction
 - V. Routing
- d. What is FFB Foundation fieldbus? List the features

Q2 Answer the following

20Mks

- a) Explain The OSI model
- b) Draw the TCP/IP model and Explain LAN Architecture including IEEE standards

Q3 Answer the following

20Mks

- a) Compare H1 and HSE segment of Foundation Field bus
- b) What is CAN Bus? Explain?

Q4 Answer the following

20Mks

- a) Explain Three components (Blocks) of Foundation fieldBus
- b) What is MODBUS and MODBUS PLUS

Q5 Answer the following

20Mks

- a) What is Profibus? Explain Profibus PA, Profibus DP and Profibus FMS
- b) Explain HART protocol and give its importance in predictive maintenance

Q6 Write short notes on (Any four)

20Mks

- I. RS232
- II. GPRS
- III. Wireless LAN
- IV. VSAT
- V. OPC

(3 Hours)

[Total Marks : 80

N.B. (1), Question No.1 is **Compulsory**.

(2) Attempt any three questions remaining four Questions.

(3) Figures to the **right** indicates full marks.

Q.1. Attempt any five:-

- Draw the general block diagram of analytical instruments and explain.
- Describe the radiation sources used in IR spectrophotometers.
- Define chemical shift and explain its significance in NMR spectrometry.
- State Beers and Lambert's Law.
- Give the list of components of mass spectrometers. Explain in brief the principle of mass spectrometry.
- What are the units of radioactivity. Explain half life period.

Q.2 a) With a neat block diagram explain an atomic absorption spectrophotometer. (10)

b) When does nuclear magnetic resonance occur. Explain the working of NMR spectrometer (10)

Q.3a) Explain with a schematic diagram the operation of a double beam UV Spectrometer (10)

b) Explain Time of flight mass spectrometer with neat diagram. (10)

Q.4 a) Explain the basic components of instrumentation for X-ray spectroscopy with a diagram (10)

b) Give classification of chromatograph. List the parts of GC. Draw and explain the working of GC. (10)

Q.5 a) Explain the principle and working of Scintillation counter (10)

b) With neat diagram explain paramagnetic oxygen analyzer (10)

Q.6 Write short notes on (any two):- (20)

- ESR
 - Infrared gas analyzer
 - GC-MS
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