T.E./Sem.VI/Electrical/May-2022

22/05/2024

Time:3 Hrs **Marks:80**

Note: 1. Q.NO. 1 is compulsory. Solve any three questions from rest.
2. Make any suitable assumption wherever applicable
3. Figure to the right indicates full Marks
4. Use of graph paper and semilog paper are compulsory wherever applicable

Q.1 Attempt any four from the following 20

a. Why a compensator is required in a system. Explain why there is more improvement in steady state if a PI controller is used instead of a lag network.

b. What is a feedback compensator. Explain the design techniques of feedback compensator.

c. Realize the lead compensator $Gc(s)=\frac{(s+4)}{(s+20.09)}$ using passive components.

d. With reference to the frequency response explain why is the phase margin increased above that desired when designing a lag comensator

e. What is an observer? Draw a block diagram of state space representation with observer.

f. Explain the region of stability in z-plane.

Q.2 a. The unity feedback system with $G(s)=\frac{K}{(s+2)(s+3)(s+8)}$ is operating with 10% overshoot. Find the transfer function of a lag network so that the appropriate static error constant equals 4 without appreciably changing the dominant poles of the uncompensated system. Use Root locus technique. 10

b. The unity feedback system with $G(s)=\frac{K}{s(s+4)(s+6)}$ is given. Design an ideal derivative compensator to yield a 16% overshoot, with a threefold reduction in settling time. Use root locus technique. 10

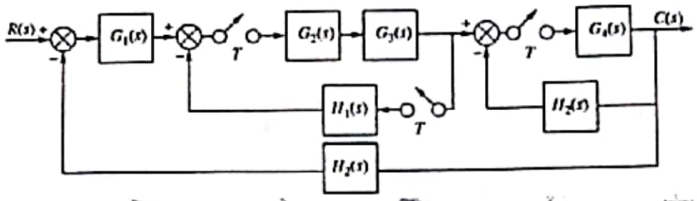
Q3. a Design a lag-lead compenstor for a unity feedback system with forward transfer function $G(s)=\frac{K}{s(s+8)(s+30)}$ to meet the following specifications: %OS=10%, Tp=0.6 sec and Kv=10. Use frequecny response technique. 10

b Explain the steps involved in the design of lag compensator using Bode-plot. 10

Q4. a. Given the following open loop plant $G(s)=\frac{20}{(s+2)(s+4)(s+8)}$. Design a state feedback controller to obtain a 15% overshoot and a settling time of 0.75 second. Place the 3rd pole 10 times as far from the imaginary axis as the dominant pole pair. Use the Phase variable representation for the state variable feedback design. 10

b. Design an observer for the plant $G(s)=\frac{10}{(s+3)(s+7)(s+15)}$ operating with 10% overshoot and a 2 sec peak time. Design the observer to respond 10 times as fast as the plant. Place the observer 3rd pole 20 times as far from the imaginary axis as the observer dominant poles. Assume the plant is represented in observer canonical form. 10

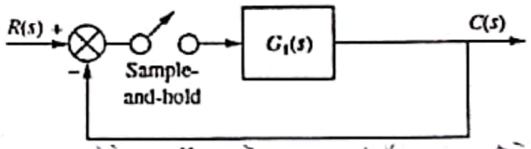
Q.5 a. Given a zero order hold in cascade with $G_1(s)=\frac{(s+2)}{(s+1)}$. Find the sample data transfer function G(z), if the sampling time T=0.5 sec. 10

b. 

10

Find C(z)/R(z) for the given system.

Q.6 a. For a digital system shown in the figure 10



Where $G_1(s)=\frac{K}{s(s+1)}$ find the range of K for stability. T=0.1 second

b. Explain the process of implementation of digital compensator. 10

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T.E./Sem.VI/Elect./May.2024

Paper / Subject Code: 89302 / Microcontroller Applications

Date: 17/05/2024

Duration – 3 Hours **Total Marks - 80**

Note:- (1) Question No.1 is compulsory.
(2) Attempt any three questions out of the remaining five questions.
(3) Assume suitable data if necessary and justify the same.

Q 1. Answer the following questions. (Any four) **20M**

a) Write any five features of PIC18 microcontroller. **5M**

b) Write an Assembly language program to (i) clear WREG and (ii) add 05H to WREG 10 times and store result at 88H memory location. **5M**

c) Differentiate between serial and parallel communication. **5M**

d) Explain all flags present in the status word of PIC microcontroller. Draw status register. **5M**

e) Explain Timer0 control register in PIC 18 Microcontroller. **5M**

Q 2 a) Classify the different interrupting sources of pic18 microcontroller and hence explain the simplified vectored interrupt process with GIE and PEIE. **10M**

Q 2 b) Explain data transfer, arithmetic and logic Instruction set of PIC18F microcontroller. **10M**

Q 3 a) What is mean by addressing modes? Explain the different addressing modes used in Pic18 microcontroller. **10M**

Q 3 b) A switch is connected to pin RD7(PORTD.7). Write a C program to monitor the status of the switch and perform the following: (Draw the diagram) a) If the SW=0 (Open), Stepper motor moves Clockwise. b) If the SW=1 (Closed), Stepper motor moves Anticlockwise. **10M**

Q 4 a) Explain the registers associated with serial communication in PIC 18F. **10M**

Q 4 b) Write a C program to flash an LED connected at pin 3 of PORTB at a frequency of 2KHz.Use Timer0 in 16-bit mode, Crystal oscillator frequency = 10MHz, prescaler of 64. **10M**

Q 5 a) Explain the Capture, Compare and PWM module (CCPx) of Pic18 microcontroller. **10M**

Q 5 b) Explain the Analog to digital (ADC) module along with the control registers associated with it used in Pic18 microcontroller. **10M**

Q 6 Write a short note on

a) Seven segment LED interfacing with PIC18 Microcontroller. **10M**

b) LCD interfacing with PIC18 Microcontroller. **10M**

IC06/Libl TE/ Sem VI/ Elect/ MA/ 17/05/2024

T.E. | Sem. VI | Elect | C. Scheme | May. 2024

Date: 15/05/2024

Paper / Subject Code: 89301 / Power System Protection & Switchgear

Duration : 3 Hours **Total Marks : 80**

Instructions:
1. Question No. 1 is compulsory
2. Attempt **any three** questions out of remaining **five** questions.
3. Assume suitable data, if necessary and justify the same.

Q1. Answer the following questions. **20**

a) Mention at least five differences between a fuse and a circuit breaker. 5
b) Explain the properties of SF6 gas that makes it suitable for arc quenching. 5
c) Explain time-graded protection of radial feeder. 5
d) What are the advantages and disadvantages of static relays over electromagnetic relays. 5

Q2. a) Draw and explain construction and working of Pantograph Isolators. 10
Q2. b) Explain the working and cut off characteristics of HRC Fuse. 10

Q3. a) Explain with neat diagram, the construction and working of Vacuum Circuit Breaker. 10

Q3. b) Explain the construction and working principle of Induction Disc Relay. 10

Q4. a) Explain the differential protection given to delta-star power transformer . 10
Q4. b) What are the desirable qualities of protective relays? Explain in detail. 10

Q5.a) What is the working principle of distance relays? Differentiate between different types of distance relay. 10
Q5.b) State various abnormal conditions of induction motor. Explain motor protection against single phasing. 10

Q6. a) Explain the three-step protection provided for transmission line. 10
Q6. b) Write a short note on Numerical Relay. 10

ICOE/Lib/T.E/SemVI/Elect/C-Scheme./PS P&S/15/05/2024

| Icoe/Lib/T.E/Elect/Sem VI/ET/29/05/2024

Paper / Subject Code: 89306 / Electric Traction (DLOC)

T.E / Elect / Sem- VI / May - 2024

29-05-2024

Time:3 Hrs **Marks:80**

Note: - 1. Question No. 1 is compulsory
2. Attempt any **three** questions out of remaining **five** questions
3. Assume suitable data if necessary & justify the same
4. Figures to the right indicates marks

Qu.1 Attempt **any Four.**

(a) Explain the requirement of ideal traction system. [5]

(b) What is the co-efficient of adhesion? Discuss the factors affecting coefficient of adhesion? [5]

(c) Discuss the suitability of series motor for traction duties. [5]

(d) Explain the construction and working of linear induction motor. [5]

(e) Explain the working of Pantograph collector. Give its advantages. [5]

(g) Explain block section concept. [5]

Qu.2 (a) Draw the Quadrilateral speed time curve and derive the expression of speed. [10]

(b) A 200 tonne motor coach having 4 motors, each developing 6000N.M.torque during acceleration, starts from rest. If up gradient is 30 in 1000,gear ratio 4, gear transmission efficiency 90%, wheel radius 45 cm, train resistance 50 N/tonne, addition of rotational inertia 10%. Calculate time taken to attain speed of 50 Kmph. If the line voltage is 3000V dc and efficiency of motor 85%, find the current during notching period. [10]

Qu.3 (a) Discuss the major equipment at traction substation [10]

(b) Explain operation of DC chopper controlled drive in motoring and regenerative braking mode [10]

Qu.4 (a) Explain the feeding and sectioning arrangements with circuit diagram. [10]

(b) Why do we provide neutral section in OHE? What considerations determine the length of neutral section? [10]

Qu.5 (a) Explain different type of catenary construction for traction system. [10]

(b) Explain the working of Automatic Weight Tension and temperature compensation Device [10]

Qu.6 (a) What is interlocking Principle? Explain various Techniques of interlocking. [10]

(b) Derive the expression of specific energy consumption. Discuss the factors affecting specific energy consumption [10]

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Paper / Subject Code: 89304 / Signals and Systems

Time (3 Hours) Marks: 80

Note: (1) Question no. 1 compulsory
(2) Attempt any 3 question out of remaining five questions.
(3) Draw neat diagram wherever necessary.

Q 1. Attempt any Four out of Six questions (5 marks each). (20)

a. Check whether the given system $y(n) = |x(n)|$ is linear/non-linear, time variant/time invariant, static/dynamic, stable/unstable, causal/non causal systems.
b. Explain Sampling theorem in detail.
c. Discuss Rectangular, Hamming windows used to design FIR filters.
d. Find the 4-point DFT of the sequence $x(n) = \{1, -2, 3, 2\}$.
e. Explain ROC and its properties.
f. Explain minimum phase, maximum phase and mixed phase systems with examples.

Q 2. a. Obtain the Z-transform of (10)
(1) $x(n) = n(n+1)\,u(n)$
(2) $x(n) = u(-n)$.

b. Determine the periodicity of the following (10)
(1) $x(t) = 2\cos 3t + 3\sin 7t$
(2) $x(t) = 5\cos 4\pi t + 3\sin 8\pi t$

Q3. a. A LTI is described by the equation $2y(n) + 3y(n-1) + y(n-2) = u(n) + u(n-1) - u(n-2)$. Find response of the system when the initial conditions are given by $y(-1) = 2$ and $y(-2) = -1$ and when unit step is applied as the input. (10)

b. Design a digital low pass FIR filter for a following specification. (10)

$$H_d(\omega) = \begin{cases} e^{-j\omega\tau} & \text{for } \omega \le \omega_c \\ 0 & \text{otherwise} \end{cases}$$

Using rectangular window of length =7 & Wc=1 rad/sample.

Q4. a. Determine inverse Z-transform of $X(z) = \dfrac{1}{1-1.5z^{-1}+0.5z^{-2}}$ (10)
for ROC (1) $|z| > 1$ (2) $|z| < 0.5$ (3) $0.5 < |z| < 1$

b. Discuss the method of Bilinear transformation for design of IIR filter. (10)

Q5. a. Explain any five properties of DFT (10)

b. Compute DFT for the sequence x(n) = {0.5,0.5,0.5,0.5,0,0,0,0) using radix -2 DIT-FFT algorithm. (10)

Q6. a) An LTI system is described by the equation: (10)

$Y(n) = x(n) + 0.8\ x(n-1) + 0.8\ x(n-2) - 0.49\ y(n-2)$

Determine the transfer function of the system, sketch poles and zeroes on the z-plane.

b) Find y(n) by using convolution if x(n) = [1,3,5,3] and h(n) = [2,3,1,1]. (10)