

SEAT No. _____

[24]

SARDAR PATEL UNIVERSITY

M.Sc. Instrumentation & Control

SEM – I, November 2017

Transducers and Instrumentation

SUB CODE: PS01CINC21

No. of Printed Pages : 02 *Sc*

DATE: 02nd Nov. 2017

DAY: Thursday

TIME: 10:00 AM TO 1:00 PM

TOTAL MARKS: 70

Q.1 Choose the correct answer.

[08]

- (1) Strain is define as _____.
(A) $\Delta L / L$ (C) Both (A) & (B)
(B) $L / \Delta L$ (D) None of above
- (2) LVDT has _____ primary coil & _____ secondary coil.
(A) one, two, (C) two, one
(B) one, one, (D) two, two,
- (3) Quartz work on the _____ principle.
(A) Pezo electric (C) Resistivity
(B) Capacitive (D) Inductive
- (4) If temperature is increase in _____ conductivity is significantly increase.
(A) Metal (C) Insulator
(B) Semiconductor (D) All of above
- (5) Hot film anemometer construct with _____.
(A) Constant current mode (C) Both (A) & (B)
(B) Constant temperature mode (D) None of above
- (6) In load cell _____ is used as transducer for weight measurement.
(A) Thermocouple (C) Strain gauge
(B) Orifice plate (D) None of above
- (7) The hall effect is used to find _____.
(A) Concentration of Hole (C) Both (A) & (B)
(B) Concentration of Electron (D) None of above
- (8) From ionization _____ are separated.
(A) Ions & electron (C) Both (A) & (B)
(B) Neutron & proton (D) All of above.

Q.2 Answer the following.(attempt any seven, each two marks)

[14]

- (1) Define hysteresis and creep in strain gauge.
- (2) Show working of digital pressure transducer.
- (3) Differentiate between Active and Passive transducer with example.
- (4) What is diaphragm? Explain with neat figure corrugated diaphragm.
- (5) Draw and explain cup type anemometer.
- (6) Explain Telemetry torque measurement system.
- (7) Show working and application of Pyrometer.
- (8) Enlist different types of flow meter.
- (9) What is photo transistor? How its working?

- Q.3 (A) Explain Variable resistance and LVDT transducer in detail. [06]
(B) Find voltage sensitivity (S_e) for potentiometer type strain gauge with necessary circuit diagram. [06]
- OR**
- (B) List and explain type of electrical strain gauges. [06]
- Q.4 (A) With necessary derivation explain the working of head type flow meter. [06]
(B) Explain in detail capsule, bourdon gauge and bellows for pressure measurement. [06]
- OR**
- (B) Explain solid state needle type and calibration technique for pressure sensor. [06]
- Q.5 (A) Enlist different type of load cells and explain any two with necessary diagram. [06]
(B) Show construction of platinum resistance thermometer elements with neat diagram. [06]
- OR**
- (B) Explain Thermocouple in detail. [06]
- Q. 6 (A) Explain hall effect phenomena in detail. [06]
(B) Draw block diagram of electronic weighing system and explain in detail. [06]
- OR**
- (B) Write a note on photomultiplier tube. [06]

-: All The Best:-

[18]

SARDAR PATEL UNIVERSITY**M.Sc. (Instrumentation & Control) Semester I Examination
MICROPROCESSOR AND MICROCONTROLLER SYSTEM (PS01CINC22)****Monday, 6th November, 2017****Time: 10:00 am – 1:00 pm****Total Marks: 70***Note: The figures to the right indicate maximum marks.*

- Q-1. **Multiple Choice Questions-** 8
1. A register in the microprocessor that keeps track of the answer or results of any arithmetic or logic operation is the
A. Stack pointer
B. Program counter
C. Instruction pointer
D. Accumulator
 2. _____ Section of 8085 Microprocessor decode machine code of the instruction.
A. Control section
B. ALU
C. Instruction decoder
D. Program counter
 3. In 8255 which signal is generated by the peripheral to indicate that it has transmit data or written data to input port.
A. Strobe input
B. Input buffer full
C. Interrupt request
D. Interrupt enable
 4. For the Programmable Interval Timer counter function is controlled by _____.
A. CLK
B. GATE
C. OUT
D. A0-A1
 5. The mode that is used to interrupt the processor by setting a suitable terminal count is
A. Mode 0
B. Mode 1
C. Mode 3
D. Mode 4
 6. 8051 has how many 16 bit registers?
A. 2
B. 4
C. 3
D. 1
 7. How is the status of the carry, auxiliary carry and parity flag affected if write instruction
MOV A,#9C
ADD A,#64H
A. CY = 0 , AC = 0 , P = 0
B. CY = 1 , AC = 0 , P = 0
C. CY = 1 , AC = 1 , P = 0
D. CY = 1 , AC = 1 , P = 1
 8. JZ, JNZ, DJNZ, JC, JNC instructions monitor the bits of which register?
A. DPTR
B. PSW
C. A
D. B
- Q-2. **Answer the following questions in short. (attempt any 7)** 14
1. Explain the Flag Register of 8085.
 2. What is the significance of ALE pin in 8085 Microprocessor?
 3. What is the use of stack pointer and program counter in 8085?

4. Explain LHL and SHLD instructions.
 5. Explain the format of the BSR mode in 8255.
 6. Explain conditional JUMP instructions of 8051.
 7. Describe all rotate instructions for 8051.
 8. Write a program for place the number 3B H in internal RAM location 40 H to 42H.
 9. Write a difference between RISC and CISC instruction set architecture.
- Q-3. (a) Explain with a block diagram of the programmable peripheral interface 8255. 6
- Q-3. (b) 1. Write a program to add two 4 digit BCD numbers. Assume data already exists in BC and DE register pairs. 3
- 3
2. Write a program to add ten data bytes. Data is stored in memory locations starting from C200. The result is 8 bit only. Store the result at C300 location.
- OR**
- Q-3. (b) 1. Write a program to multiply 2, 8 bit numbers. The numbers are to be loaded in D and C registers. Store the result in HL register pair. 3
- 3
2. Write a program to transfer a block of data. The data is stored in memory from C550 H to C55F H. The data is to be stored from C570 H to C57F H in reverse order.
- Q-4. (a) With suitable timing wave forms explain MODE-1 in 8254. 6
- (b) Draw and explain the block diagram of 8259. 6
- OR**
- (b) With the functional block diagram explain 8254 Programmable Interval Timer. 6
- Q-5. (a) Describe various operating modes of Timers in 8051 Microcontroller. 6
- Q-5. (b) Explain different addressing modes of 8051 Microcontroller. 6
- OR**
- (b) 1. Write a program to load R7 by data from external RAM location A397 H. 3
2. Write a program to add two 16 bit numbers 42E1 H and 255c H. store the result of LSB in R5 and MSB in R7. 3
- Q-6. (a) Give a classification on embedded system. 6
- Q-6. (b) With example, explain Arithmetic instructions for 8051. 6
- OR**
- (b) What is an embedded system? Describe the working elements of it. 6

Best luck

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M. Sc. INSTRUMENTATION & CONTROL
PS01CINC23: PRINCIPLES OF CONTROL SYSTEMS
Wednesday, 8th November, 2017, Time: 10:00 am – 1:00 pm

Total Marks: 70

Note: The figures to the right indicate maximum marks.

Q-1. **MCQ** [8]

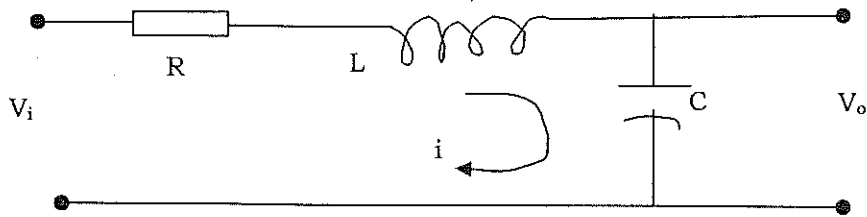
- (1) A system in which output is dependent on input but controlling action is totally independent of the output is known as control system.
(a) lumped parameter (b) time invariant (c) open loop (d) closed loop
- (2) The graphical representation of the variables of set of linear algebraic equations representing the system is
(a) block diagram (b) signal flow graph (c) transfer function (d) all
- (3) When $\xi = 0$, the system is
(a) over damped (b) under damped (c) critically damped (d) un damped
- (4) 'Order' is the property ofsystem.
(a) open loop (b) closed loop (c) non stable (d) unstable
- (5) The of a linear system can be determined from the locations of closed loop poles in s- plane.
(a) gain (b) root locus (c) stability (d) frequency
- (6) The graphical method in which movement of poles in the s - plane is sketched when Gain is varied from "0 to ∞ " is
(a) Bode plot (b) Nyquist plot (c) Polar plot (d) Root Locus
- (7) The torque developed on motor shaft is directly proportional to the armature current and
(a) back emf (b) field flux (c) rotor displacement (d) armature resistance
- (8) Which servomotor has less stability problems?
(a) ac (b) dc (c) bc (d) ec

Q-2. **Answer in Brief (any 7)** [14]

- (1) Define the terms with respect to SFG: source, sink node and dummy node.
- (2) Draw the block diagram of closed loop system with neat labels.
- (3) Determine the transfer function if impulse response is $e^{-2t} \cdot \sin 3t$.
- (4) Draw the equivalent mechanical system for the set of equations given as:
Node 1: $F = M_3 s^2 X_1 + K_3(X_1 - X_2)$
Node 2: $0 = M_2 s^2 X_2 + K_3(X_2 - X_1) + K_2(X_2 - X_3)$
Node 3: $0 = M_1 s^2 X_3 + B_1 s X_3 + K_1 X_3 + K_2(X_3 - X_2)$

(P.T.O)

(5) Find transfer function of given electrical network.



(6) What are the advantages of Routh's criteria for stability of system?

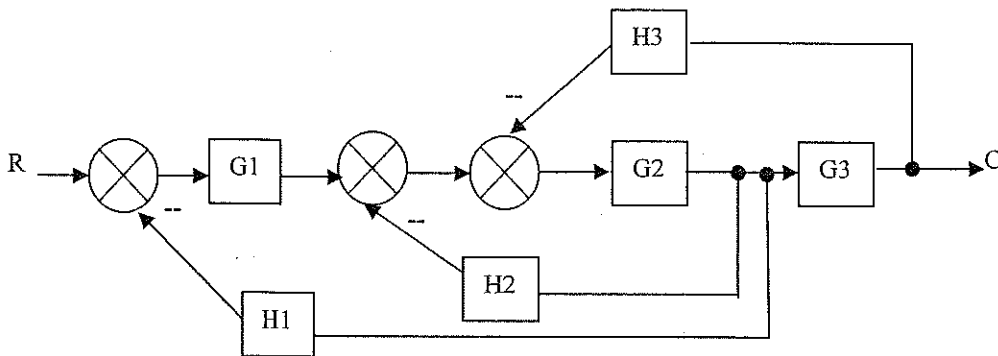
(7) Write the conditions to determine number of branches, from poles and zeros in Root Locus method.

(8) What are the features and limitations of Field controlled dc servomotor.

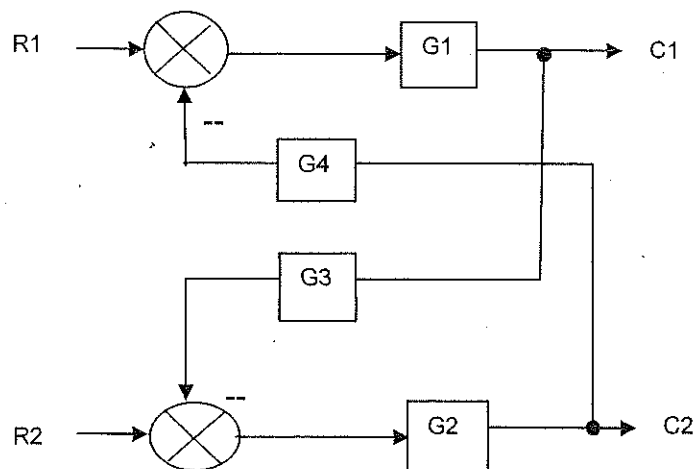
(9) Define terms: Cut off frequency and Resonant Peak.

Q-3. (a) Obtain transfer function by block diagram reduction.

[6]

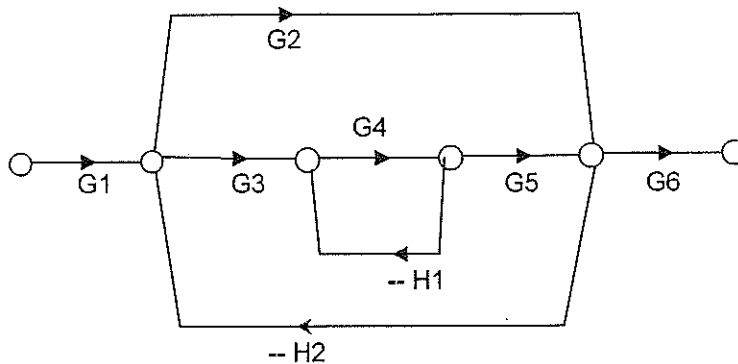


(b) Obtain the expression for C_1 / R_1 , C_1 / R_2 and C_2 / R_1 , C_2 / R_2 for the given multiple input multiple output system. [6]



OR

- (c) Find the overall transfer function by using Mason's gain formula for signal flow graph. [6]



- Q-4. (a) Discuss TYPE 0, 1 & 2 systems for Step, Ramp and Parabola inputs. [6]
 (b) Obtain the expression for $y(t)$ which is satisfying the differential equation. [6]

$$\frac{d^2 y(t)}{dt^2} + 6 \frac{dy(t)}{dt} + 8y(t) = 16e^{-t} \quad \text{Neglect initial condition.}$$

OR

- (c) A second order system is given by [6]

$$G(s)H(s) = \frac{25}{s^2 + 6s + 25}$$

Find the characteristic equation, damping ratio, delay time, peak time, peak overshoot and settling time if subjected to unit step input.

- Q-5. (a) Sketch the rough nature of Root locus for a unity feedback system having [6]

$$G(s) = \frac{K}{s(s+2)(s+4)}$$

- (b) Write the general steps to solve the problem on Root Locus and mention its advantages. [6]

OR

- (c) Find the stability of the system using Routh's criterion for characteristic equation: [6]
 $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0.$

- Q-6. (a) What are the requirements of good servomotor? Compare ac and dc servomotors. [6]

- (b) For a unity feedback system, $G(s) = \frac{80}{s(s+2)(s+20)}$. [6]

Draw the rough nature of Bode plot.

OR

- (c) Derive an equation of transfer function for a field controlled DC motor. [6]

(64)

SEAT No. _____

No. of Printed pages = 2

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar - 388120

I SEM

M. Sc. Instrumentation & Control

PS01EINC21: Instrumentation of Processing Circuits

10th November, 2017, Friday, Time: 10:00 am – 1:00 pm

Total Marks: 70

Note: The figures to the right indicate maximum marks.

- Q-1. **MCQ** [8]
- (1) The input stage of an op amp is usually a
(a) differential amp (b) CE amp (c) swap amp (d) class-B pull up amp
 - (2) With both bases grounded, the only offset that produces an error is the
(a) input offset voltage (b) input offset current (c) input bias current (d) β
 - (3) At the unity gain frequency, open loop voltage gain is
(a) one (b) zero (c) very large (d) half
 - (4) Which circuit is used to know how much a signal is below or above a particular reference voltage?
(a) inverting (b) comparator (c) dead zone (d) peak detector
 - (5) Which filter has highly non-linear phase response with frequency and is maximally flat in pass band?
(a) Bessel (b) Butterworth (c) Chebyshev (d) Cauer
 - (6) The cut off frequency occurs at attenuation.
(a) 1 dB (b) 0 dB (c) 3 dB (d) 0.707 dB
 - (7) Why low frequency signals cannot be transmitted over long distances through space?
(a) poor radiation efficiency (b) high gain (c) high power (d) poor transmitter
 - (8) Once the input frequency is applied, the VCO frequency starts to change and the PLL is said to be in the Mode.
(a) Free running (b) Capture (c) Locked (d) Phase

- Q-2. **Answer in Brief (any 7)** [14]
- (1) What are the ideal characteristics of Op-amp?
 - (2) Draw inverting adder circuit and write equation for output voltage.
 - (3) For positive feedback amplifier explain upper and lower threshold voltage.
 - (4) What is voltmeter? Explain DC voltmeter.
 - (5) Define the term frequency response and slew rate.
 - (6) What is modulation index? Show amplitude modulated waveform with neat label.
 - (7) Determine the values of resistor, R and capacitors C_1 , C_2 for a cut off frequency of 1KHz, where capacitor, $C_3 = 0.01\mu\text{F}$ in low pass filter having roll off of -60 dB / decade.



- (8) Explain in brief sample and hold circuit.
- (9) An 8-bit DAC has a resolution of 20mV/bit. What is the analog output voltage for the digital input codes of 00010110 and 10000000?

Descriptive Questions

- Q-3. (a) Explain positive and negative voltage level detector using inverting and non inverting amplifier circuit. [6]
- (b) Write a short note on smoke detector circuit using 741 op-amp. [6]
- OR**
- (c) How to identify upper and lower threshold voltage with voltage level detector. [6]
- Q-4. (a) Explain the operation of peak detector circuit with its limitations. [6]
- (b) With appropriate circuit explain AC to DC converter. [6]
- OR**
- (c) With positive and negative output explain operation of dead zone circuit. [6]
- Q-5. (a) i. A band pass voice filter has lower and upper frequencies of 300 and 3000Hz. Find the bandwidth and resonant frequency. [6]
- ii. Define quality factor. Find the quality factor of voice filter that has bandwidth of 2700 Hz and resonant frequency of 950Hz.
- (b) Draw neat diagram of high pass filter circuit and frequency response for a 60 db / decade slope and write the design procedure. If $C_1 = C_2 = C_3 = C = 0.1\mu\text{F}$. Determine (i) R_3 , (ii) R_1 and (iii) R_2 for $\omega_c = 1\text{krad/s}$. [6]
- OR**
- (c) What do you understand by active filters? Write steps to design low pass Butterworth filter for a roll off of -40 dB / decade slope and determine R_1 and R_f for a cut off frequency of 1KHz where $C_1 = 0.01\mu\text{F}$. [6]
- Q-6. (a) What is PLL? Explain block diagram of PLL and explain features of NE565 IC. [6]
- (b) Write a note on DAC-08 IC. [6]
- OR**
- (c) Explain the block diagram of ICL8038 function generator. [6]

— X —
 (2)