

(3 Hours)

[Total Marks : 80]

- NB. : (1) Question no. 1 is compulsory
(2) Solve any three questions from question no. 2 to question no. 6.
(3) Assume suitable data if required.

1. Solve any four questions.

- (a) State the properties of Laplace transform and derive differentiation property of Laplace transform. 20
- (b) Prove that $\int_{-\infty}^{\infty} x(t) dt = 0$ if $x(t)$ is odd
- (c) Find Z-Transform of given signal and Sketch ROC
 $x(n) = 2^n u(n) + 3^n u[-n-1]$
- (d) Find the Fourier transform of two sided exponential signal.
- (e) Find the odd and even part of given signal
 $x(t) = (1+t^3) (\cos^3 10t)$

2. (a) Determine whether following Systems are static, linear, time variant, causal and stable 10

- (i) $y(t) = x(t+10) + x^2(t)$
(ii) $y[n] = x[n^2]$

(b) If $x_1[n]$ and $x_2[n]$ are two periodic sequences given below. Find the convolution between them 10

$$\begin{array}{ccccccc} x_1[n] & = & [1, -2, 0, 1] & \text{and} & x_2[n] & = & [2, 1, 1, 0] \\ & & \uparrow & & \uparrow & & \end{array}$$

3. (a) Find inverse Laplace transform for all possible Rocs. 10

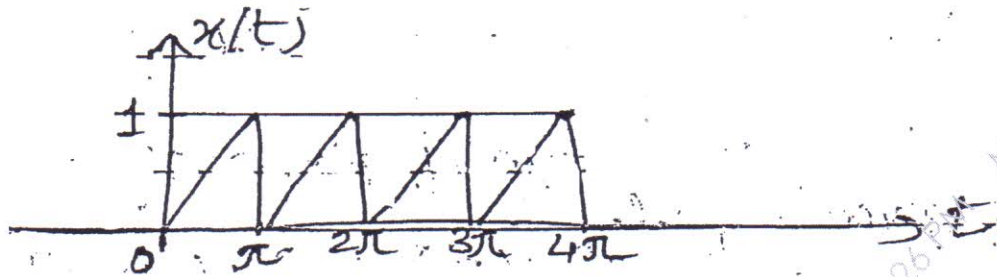
$$x(s) = \frac{5s-10}{9s^2-16}$$

(b) Find out z^{-1} of the following signal. 10

$$x(z) = \frac{16z^2 - 4z + 1}{8z^2 + 2z - 1} \quad \text{R.O.C. is } |z| > \frac{1}{2}$$

[TURN OVER]

4. (a) Find trigonometric Fourier series of given $x(t)$ signal



(b) $H(s) = \frac{1}{(s^2 - 16)(s^2 - 9)}$

Determine $h(t)$ if

- (i) System is stable
- (ii) System is causal
- (iii) System is neither stable nor causal

5. (a) Sketch the following Signal

$$x(t) = u(t) - r(t-1) + 2r(t-2) - r(t-3) + u(t-4) - 2u(t-5)$$

- (b) Find Laplace transform of following and draw R.O.C

- (i) $x(t) = \sin(\omega t) u(t)$
- (ii) $x(t) = t u(t) * e^{-3t} u(t)$

6. (a) Find whether given signals are energy or power signals

- (i) $x(n) = n \quad n \geq 0$
 $= 0 \quad n < 0$
- (ii) $x(t) = Ae^{-5t} u(t)$

- (b) State the Dirichlet conditions for the existence of Fourier series.

[TURN OVER]

- (c) Determine whether following signals are periodic or not. If Periodic find Fundamental period

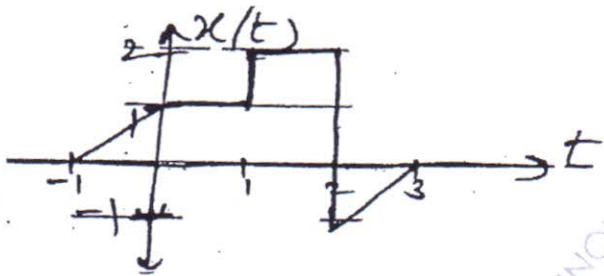
(i) $x(t) = 2 \cos \left(\frac{9\pi}{2} t \right)$

(ii) $x(n) = \cos(0.01 \pi n)$

- (d) Carry out the following operations on the signal shown in figure below

(i) $x(1-t)$

(ii) $[x(t) + x(1-t)] u(t-1)$



May-2016.

QP Code : 31094

(03 Hours)

(80 Marks)

N.B:1. Question No. 1 is compulsory.

2. Attempt **any Three** from remaining questions.

3. Assume suitable data wherever necessary.

4. Figure to right indicates full marks.

1. Attempt **any five** questions- 20
 - a) Explain Von Neuman and Harvard architecture.
 - b) Give comparisons between 8051 microcontroller families.
 - c) Explain bit addressable memory of 8051.
 - d) Explain in brief the simulator.
 - e) Explain in short SPI.
 - f) Interface EEPROM to 8051 using I²C protocol and write a program to read data from memory.
2.
 - a) Explain the Port structures of 8051 microcontroller. 10
 - b) Write a program to create a square wave of 50% duty cycle on P1.5 bit of 8051 Microcontroller. Timer0 is used to generate the time delay. Analyze the program. 10
3.
 - a) Draw and explain addressing modes of 8051 with instruction example. 10
 - b) Draw and explain the interfacing of Analog to Digital Conversion (ADC) with 8051 and write a program code to show this conversion. 10
4.
 - a) Explain the function of following registers are used in 8051 microcontroller- 10
(i) PSW, (ii) DPTR, (iii) PC and (iv) SP.
 - b) Explain the operation of Timer2 in 8051. 10
5.
 - a) Draw and explain complete interfacing diagram of Data Acquisition System with 8051 microcontroller. 10
 - b) In a semester, a student has to take six courses. The marks of the student (out of 25) are stored in RAM locations 47H onwards. Write a program to find the average marks and output it on port1 using 8051 microcontroller. 10

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6. Attempt any two-

20

- a) Interface 7-segment display with 8051 and write a program to display 0-9 counter with a predetermined delay.
 - b) Write a program to transfer a letter 'Y' serially at 9600 baud continuously, and also to send a letter 'N' through port 0, which is connected to a display device.
 - c) Draw and explain block diagram of 8051 microcontroller. State technical features of 8051 microcontroller.
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Note : 1. Question no. 1 is compulsory

2. Attempt any **three** questions from remaining **five** questions

3. Figures to the right indicate full marks

4. Assume suitable data whenever necessary

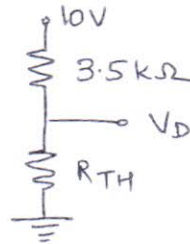
Duration : 03 hours

Marks : 80

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- Q.1. a. Explain the characteristics of digital data. 20
- b. Explain lead compensation in bridge.
- c. A bridge circuit has $R_1 = R_2 = R_3 = R_4 = 120\Omega$ resistances and a 10V supply. Suppose a $3\frac{1}{2}$ digit DVM on a 200mV scale will be used for the null detector. Find the resistance resolution for measurements of R_4 .
- d. Explain the significance of all-pass filters.
- Q.2. a. Mention the applications of instrumentation amplifier. Explain any one in detail. 10
- b. Draw and explain circuit diagram of absolute value circuit using op-amp. Discuss its advantages over traditional diode rectifier. 10
- Q.3. a. Draw and explain circuit for ideal integrator with waveforms. Discuss the problems associated with ideal integrator and draw the circuit diagram for practical integrator. 10
- b. What are the advantages of active filters over passive filters. Design a second-order low pass filter at a high cut-off frequency of 1kHz. 10
- Q.4. a. Explain the following terms : 10
- (i) Signal level and bias changes
 - (ii) Filtering and impedance matching
 - (iii) Linearization
 - (iv) Concept of loading
- b. A sensor outputs a voltage ranging from -2.4 to -1.1V. For interface to an analog-to-digital converter, this needs to be 0 to 2.5V. Develop the required signal conditioning. 10

[TURN OVER

- Q. 5. A thermistor is to monitor room temperature. It has a resistance of $3.5\text{k}\Omega$ at 20°C with a slope of $-10\%/^\circ\text{C}$. The dissipation constant is $P_D = 5\text{mW}/^\circ\text{C}$. It is proposed to use the thermistor in the divider of figure shown below to provide a voltage of 5.0V at 20°C . Evaluate the effects of self-heating. 10



- b. Draw and explain the principle and construction of metal strain gauges. What is the signal conditioning associated with it. 10
- Q.6. Write short notes on : (any four) 20
- a. Sample and hold circuit
 - b. Phase Locked loop
 - c. IC 555 timer
 - d. Data Acquisition System
 - e. A to D converters
 - f. SMPS

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