

**Electrical Engineering Department**  
**College of Engineering, Pune**  
**End-Semester Examination.**  
**(EE-207) Electrical Measurements and Instrumentation.**

**Class: S.Y.B.Tech. (Electrical)**

**Duration: 3 hours**

**Date: 10/11/2010**

**Max. Marks: 50**

**Instructions:**

**1. Figures to the right indicate full marks.**

**2. Solve any five questions.**

**Q.1 A]** Define transducers. Give classification of transducers. Mention two example of each of the type. ----- (5)

**Q.1 B]** Mention the merits and demerits of digital instruments over analog instruments. Draw a block diagram of digital voltmeter. ----- (5)

**Q.2 A]** What are the various types of displays which are used for the presentation of outputs of digital systems in visual form? Explain any one in detail.

**Q.2 B]** with the help of neat diagram explain the working of wave analyzer.

**Q.3 A]** Describe with the neat sketches the i) Bourdon tube, ii) bellows and iii) diaphragms. ---- (5)

**Q.3 B]** With a neat diagram explain working of LVDT for measurement of displacement. ----- (5)

**Q.4 A]** Name any three devices used for measurement of temperature electrically. Explain construction and working principle of resistance thermometer. ----- (5)

**Q.4 B]** Which transducers are used for measurement of flow of a fluid? Explain working of Rota meter in detail. ----- (5)

**Q.5 A]** What is Hall Effect? Explain the working of Hall Effect transducers. ----- (5)

**Q.5 B]** A moving coil instrument whose resistance is 25 Ohm gives full scale deflection with a voltage of 25 mV. This instrument is to be used with a series multiplier to extend its range to 10 V. calculate external resistance required. What is total resistance in the voltmeter circuit? ----- (5)

Q.6 A] Derive the mathematical expression for measurement of high R using loss of charge method. A capacitor having a capacitance of 2.5 microfarad is charged to a potential of 500 V DC and is discharged through the high resistance. An electrostatic voltmeter, kept across the high resistance reads the voltage as 300 V at the end of 60 seconds. Calculate value of high resistance. ----- (5)

Q.6 B] Write short notes:

(i) Weston synchroscope

(ii) Inductance measurement using Maxwell Bridge. ----- (5)

Q.7 A] Mention various electronic recording devices and explain in detail the working of strip chart recorder. ----- (5)

Q.7 B] Derive the formula for measurement of insulation resistance when power is in. ----- (5)

**\*Best of Luck\***

**College of Engineering, Pune**  
**END SEMESTER EXAM Nov 2010**  
**Year (S.Y.B.Tech)**

(ET-202)-(Digital Electronics and Hardware Description Language)

Day & Date- Tuesday 23/11/2010  
 Timing- 10am-1pm

Max. Marks-50  
 Duration – 3 Hours

**Instructions:**

1. Neat diagrams must be drawn wherever necessary.
2. Figure to the right indicates full marks.
3. Assume suitable data, if necessary.

- |      |    |                                                                                                                                 |         |
|------|----|---------------------------------------------------------------------------------------------------------------------------------|---------|
| Q. 1 | A. | Explain race around condition in J-K flip-flop.mention solution for it.                                                         | 3 marks |
|      | B. | Explain the significance of parity bit .                                                                                        | 1 mark  |
|      | C  | Draw and Explain ALU.                                                                                                           | 6 marks |
| Q. 2 | A. | Design and implement MOD-10 ripple counter using J-K flip-flops and explain with output waveforms.                              | 5 marks |
|      | B. | Draw and explain working of 3 bit Universal shift register with parallel load, shift right and shift left facility.             | 5 marks |
| Q. 3 | A. | Draw the ASM chart for a 2 bit counter having one enable line E such that:<br>E=1: counting enabled<br>E=0: counting disabled   | 5 marks |
|      | B. | Design a pulse train generator to generate a pulse train 110011.... using D flip-flop.                                          | 5 marks |
| Q. 4 | A. | Explain with the help of circuit diagram 2 input TTL NAND gate with Totem pole output driver.                                   | 4 marks |
|      | B. | (i) What is the difference between low power TTL and Schottky TTL?                                                              | 2 marks |
|      |    | (ii) Compare 5400 and 7400 TTL series with respect to operating temperature range, power supply voltage range and applications. | 2 marks |
|      | C  | Define the following terms regarding a logic family:                                                                            | 2 marks |
|      | i  | Noise margin                                                                                                                    |         |
|      | ii | Propagation delay                                                                                                               |         |
| Q. 5 | A. | What is the difference between concurrent and sequential statements of VHDL?                                                    | 3 marks |
|      | B. | Write a VHDL code for a 2:4 decoder.                                                                                            | 4 marks |
|      | C. | With the help of suitable example explain data objects:                                                                         | 3 marks |
|      | i  | Constant                                                                                                                        |         |
|      | ii | Signal                                                                                                                          |         |

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**College of Engineering, Pune**  
**END SEMESTER EXAM**  
**Year (S. Y. B.Tech)**  
**(ET-203)- (Signals and Systems)**

**Day & Date:** 20/11/10  
**Timing:** 10am to 1pm

**Max. Marks:** 50  
**Duration:** 3 Hrs.

**Instructions:**

1. Figures to the right indicate full marks.
2. All questions are compulsory.
3. Assume Suitable data wherever necessary.
4. Draw neat figure wherever required.

Q.1 a] A pair of sinusoidal signal with a common angular frequency is defined by [3]

$$x_1[n] = \sin[5\pi n]$$

and  $x_2[n] = \sqrt{3} \cos[5\pi n]$

- i) Specify the condition which the period  $N$  of both  $x_1[n]$  and  $x_2[n]$  must satisfy for them to be periodic. And find out the fundamental period.
- ii) Evaluate the amplitude and phase angle of the composite sinusoidal signal

$$y[n] = x_1[n] + x_2[n]$$

b] A continuous-time signal  $x(t)$  is shown in fig.1. Sketch and label each of the [3]

- i)  $x(t) u(1-t)$
- ii)  $x(t) [u(t) - u(t-1)]$
- iii)  $x(t) \delta(t - 3/2)$

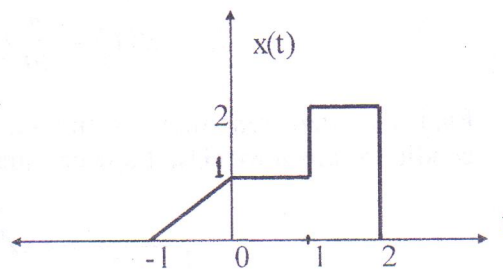


Fig.1

c] Consider the RL circuit shown in fig.2. Find a particular solution for this [4] system with an input  $x(t) = \cos(\omega_0 t)$  V.

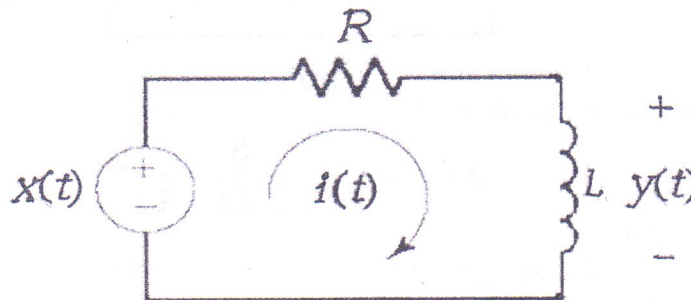


Fig.2

- Q.2 a) Perform convolution of given data sequences using mathematical equation of convolution. [3]

$$x[n]=\{1,-2,3,-2\}; h[n]=\{2,-3,4\}$$

- b) Consider a casual and stable LTI system whose input  $x[n]$  and output  $y[n]$  are related through the second order difference equation [4]

$$y[n] - \frac{1}{6}y[n-1] - \frac{1}{6}y[n-2] = x[n]$$

Determine

- The frequency response  $H(e^{j\omega})$  of the system.
- The impulse response  $h[n]$  of the system.
- The system output of the input  $(\frac{1}{4})^n u[n]$

- c) Determine the Fourier series coefficient of exponential representation of [3]

$$x(t) = \begin{cases} 1, & |t| < T_1 \\ 0, & T_1 < |t| < \frac{T}{2} \end{cases}$$

- Q.3 a) State and prove the following properties of Fourier Transform [4]
- Differentiation in time
  - Differentiation in frequency. Hence determine the Fourier transform of the signals

- $x(t) = te^{-at}u(t)$  and

- $x(t) = \frac{d}{dt} \{ [e^{-2t}u(t)] * [e^{-3t}u(t-3)] \}$

- b) Find the step response of the circuit shown in fig.3. Assume initial conditions are zero. (Use Laplace transform). [3]

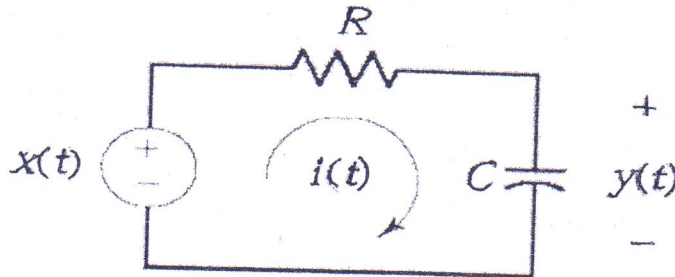


Fig.3

- c) Find the inverse transform of [3]

$$X(s) = \frac{5}{(s+2)(s-2)}$$

if the ROC is

- $2 > \text{Re}\{s\} > -2$
- $\text{Re}\{s\} > 2$
- $\text{Re}\{s\} < -2$

- Q.4 a) Determine the output of the system represented by the differential equation. [4]

$$\frac{d^2 y(t)}{dt^2} + 6 \frac{dy(t)}{dt} + 8y(t) = \frac{dx(t)}{dt} + 2x(t)$$

for unit step signal  $x(t) = u(t)$ .

Assume the initial conditions on the system are

$$y(0^+) = 1 \text{ and } \frac{dy(0^+)}{dt} = 2$$

Identify the forced response of the system and the natural response of the system. (Use Laplace transform).

- b) Define ROC of z-transform. Write the properties of ROC of z-transform [3]

OR

- b) Identify the ROC associated with the z-transform for each of the following signals. [3]

i)  $x[n] = \left(-\frac{1}{2}\right)^n u[-n] + 2\left(\frac{1}{4}\right)^n u[n]$

ii)  $y[n] = \left(-\frac{1}{2}\right)^n u[n] + 2\left(\frac{1}{4}\right)^n u[n]$

iii)  $w[n] = \left(-\frac{1}{2}\right)^n u[-n] + 2\left(\frac{1}{4}\right)^n u[-n]$

- c) Find the inverse z-transform of [3]

$$X(z) = \frac{z^3 - 10z^2 - 4z + 4}{2z^2 - 2z - 4}$$

with ROC  $|z| < 1$

- Q.5 a) Determine the z-transform of the signal [2]

$$x[n] = a^n u[n] - b^n u[-n - 1]$$

for  $a, b < 1, b > a$ . And plot the ROC.

- b) Depict the parallel form representation for the transfer function [2]

$$H(z) = \frac{4 - \frac{1}{2}z^{-1} - \frac{1}{2}z^{-2}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 + \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)}$$

- c) A unity feedback control system has  $G(s) = \frac{80}{s(s+2)(s+20)}$  Draw the Bode plot. Determine Gain margin, Phase margin, Gain cross over frequency, and phase cross over frequency. Comment on the stability. [6]

# College of Engineering, Pune

END SEMESTER EXAM Nov/Dec 2010

(S.Y.BTech)

(ET 232)- (Principles of Electronic communication)

Day & Date- Thursday 10/11/2010

Max. Marks-50

Timing- 10 am to 1 pm

Duration – 3 hrs.

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Instructions:

1. Each question carry 10 marks..
  2. Figures to the right indicate full marks.
  3. Assume suitable data wherever necessary.
  4. Draw neat figure wherever required
- 

Q.1 A. A carrier wave of amplitude 5V and frequency 90 MHz is frequency modulated by sinusoidal voltage of amplitude 5V and frequency 10 KHz. Frequency deviation is 1 KHz/V. Sketch the spectrum of the FM wave ( up to **Two sidebands**, *Refer the data given by Bessel function in chart*). 05

B. Differentiate between 05

- 1) Wired communication and Wireless communication
- 2) Serial communication and Parallel communication

OR

B. Differentiate between

- 1) Amplitude modulation and Frequency Modulation
- 2) GPIB bus protocol and CAN bus protocol

Q.2 A. 1) Calculate the minimum data rate needed to transmit audio signal with sampling rate 40 KHz and 14 bits per second. 02

2) Equation of a square wave is given as

$$v(t) = 4/\pi [ \sin(2\pi \times 10^3 t) + (1/3)\sin(6\pi \times 10^3 t) + (1/5)\sin(10\pi \times 10^3 t) + \dots ] \quad 03$$

Sketch the spectrum of the signal upto 7<sup>th</sup> harmonic.

- B. Discuss about granular noise and slope overload noise in delta modulation. Also write the solution to avoid these noises. 05

OR

- B. Discuss about the noises in fiber optic communication. 05

- Q. 3 A. In an optical fiber of glass with an refractive index of 1.55 and that of cladding as 1.51, find 05

- 1) Numerical aperture
- 2) Acceptance angle

Assume the launching of light is from air.

- B. What are different satellite orbits? Write about the advantages and disadvantages of those orbits with an example of system using those orbits. 05

OR

- B. Write about the terms in relation with PSTN 05

- 1) Local loop
- 2) Ring and Tip
- 3) Number plan
- 4) Different tones
- 5) Trunk

- Q. 4 A. Find the velocity and orbital period of a satellite in circular orbit which is 500 Km above earth surface. 05

What is approximate height of a geosynchronous satellite?

- B. Write about the terms in relation with cellular telephony 05

- 1) Cell
- 2) Frequency reuse
- 3) Cell splitting
- 4) Control channel
- 5) MIN

OR

- B. Write the steps of handshaking between mobile handset and control unit in following situations 05

- 1) Receiving a call
- 2) Making a call

- Q. 5 A. Sketch the amplitude modulated waveform for  $m=0.5$ ,  $m=1$  and  $m=1.5$  05  
The sketch should be to the scale.



B. Write about general analog communication system which includes transmitter and receiver. Discuss about each block in detail. 05

OR

B. What is SS7 in case of mobile telephony?

05

TABLE 4.1

| m    | J <sub>0</sub> | J <sub>1</sub> | J <sub>2</sub> | J <sub>3</sub> | J <sub>4</sub> | J <sub>5</sub> | J <sub>6</sub> | J <sub>7</sub> | J <sub>8</sub> | J <sub>9</sub> | J <sub>10</sub> | J <sub>11</sub> | J <sub>12</sub> | J <sub>13</sub> | J <sub>14</sub> | J <sub>15</sub> | J <sub>16</sub> | J <sub>17</sub> | J <sub>18</sub> | J <sub>19</sub> | J <sub>20</sub> |      |
|------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------|
| 0    | 1.00           |                |                |                |                |                |                |                |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 0.25 | 0.98           | 0.12           |                |                |                |                |                |                |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 0.5  | 0.94           | 0.24           | 0.03           |                |                |                |                |                |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 0.75 | 0.86           | 0.35           | 0.07           | 0.01           |                |                |                |                |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 1    | 0.77           | 0.44           | 0.11           | 0.02           |                |                |                |                |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 1.25 | 0.65           | 0.51           | 0.17           | 0.04           | 0.01           |                |                |                |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 1.5  | 0.51           | 0.56           | 0.23           | 0.06           | 0.01           |                |                |                |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 1.75 | 0.37           | 0.58           | 0.29           | 0.09           | 0.02           |                |                |                |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 2    | 0.22           | 0.58           | 0.35           | 0.13           | 0.03           | 0.01           |                |                |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 2.25 | 0.08           | 0.55           | 0.40           | 0.17           | 0.05           | 0.01           |                |                |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 2.4  | 0.00           | 0.52           | 0.43           | 0.20           | 0.06           | 0.02           |                |                |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 2.5  | -0.05          | 0.50           | 0.45           | 0.22           | 0.07           | 0.02           |                |                |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 2.75 | -0.16          | 0.43           | 0.47           | 0.26           | 0.10           | 0.03           | 0.01           |                |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 3    | -0.26          | 0.34           | 0.49           | 0.31           | 0.13           | 0.04           | 0.01           |                |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 3.5  | -0.38          | 0.14           | 0.46           | 0.39           | 0.20           | 0.08           | 0.03           | 0.01           |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 4    | -0.40          | -0.07          | 0.36           | 0.43           | 0.28           | 0.13           | 0.05           | 0.01           |                |                |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 4.5  | -0.32          | -0.23          | 0.36           | 0.43           | 0.22           | 0.42           | 0.35           | 0.20           | 0.08           | 0.03           |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 5    | -0.18          | -0.33          | 0.05           | 0.36           | 0.39           | 0.26           | 0.13           | 0.05           | 0.02           | 0.01           |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 5.5  | 0.00           | -0.34          | -0.12          | 0.26           | 0.40           | 0.32           | 0.19           | 0.09           | 0.03           | 0.01           |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 6    | 0.15           | -0.28          | -0.24          | 0.11           | 0.36           | 0.36           | 0.25           | 0.13           | 0.06           | 0.02           | 0.01            |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 6.5  | 0.26           | -0.15          | -0.31          | -0.03          | 0.28           | 0.37           | 0.30           | 0.18           | 0.09           | 0.04           | 0.01            |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 7    | 0.30           | -0.01          | -0.30          | -0.17          | 0.16           | 0.35           | 0.34           | 0.23           | 0.13           | 0.06           | 0.02            | 0.01            |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 7.5  | 0.27           | 0.14           | -0.23          | -0.26          | 0.02           | 0.28           | 0.35           | 0.28           | 0.17           | 0.09           | 0.04            | 0.01            | 0.01            |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 8    | 0.17           | 0.24           | -0.11          | -0.29          | -0.11          | 0.19           | 0.34           | 0.32           | 0.22           | 0.13           | 0.06            | 0.03            | 0.01            | 0.01            |                 |                 |                 |                 |                 |                 |                 |      |
| 8.5  | 0.04           | 0.27           | 0.02           | -0.26          | -0.21          | 0.07           | 0.29           | 0.34           | 0.27           | 0.17           | 0.09            | 0.04            | 0.02            | 0.01            |                 |                 |                 |                 |                 |                 |                 |      |
| 8.65 | 0.00           | 0.27           | 0.06           | -0.24          | -0.23          | 0.03           | 0.27           | 0.34           | 0.28           | 0.18           | 0.10            | 0.05            | 0.02            | 0.01            |                 |                 |                 |                 |                 |                 |                 |      |
| 9    | -0.09          | 0.25           | 0.14           | -0.18          | -0.27          | -0.06          | 0.20           | 0.33           | 0.30           | 0.21           | 0.13            | 0.06            | 0.03            | 0.01            |                 |                 |                 |                 |                 |                 |                 |      |
| 10   | -0.25          | 0.04           | 0.26           | 0.06           | -0.22          | -0.23          | -0.01          | 0.22           | 0.32           | 0.29           | 0.21            | 0.12            | 0.06            | 0.03            | 0.01            |                 |                 |                 |                 |                 |                 |      |
| 11   | -0.17          | -0.18          | 0.14           | 0.23           | -0.01          | -0.24          | -0.20          | 0.02           | 0.23           | 0.31           | 0.28            | 0.20            | 0.12            | 0.06            | 0.03            | 0.01            | 0.10            |                 |                 |                 |                 |      |
| 12   | 0.05           | -0.22          | -0.08          | 0.20           | 0.18           | -0.07          | -0.24          | -0.17          | 0.04           | 0.23           | 0.30            | 0.27            | 0.20            | 0.12            | 0.07            | 0.03            | 0.01            | 0.01            |                 |                 |                 |      |
| 13   | 0.21           | -0.07          | -0.22          | 0.00           | 0.22           | 0.13           | -0.12          | -0.24          | -0.14          | 0.07           | 0.23            | 0.29            | 0.26            | 0.19            | 0.12            | 0.07            | 0.03            | 0.01            | 0.01            |                 |                 |      |
| 14   | 0.17           | 0.13           | -0.15          | -0.18          | 0.08           | -0.15          | -0.23          | -0.11          | 0.08           | 0.24           | 0.29            | 0.25            | 0.19            | 0.12            | 0.07            | 0.03            | 0.02            | 0.01            |                 |                 |                 |      |
| 15   | -0.01          | 0.20           | 0.04           | -0.19          | -0.12          | 0.13           | 0.21           | 0.03           | -0.17          | -0.22          | -0.09           | 0.10            | 0.24            | 0.28            | 0.25            | 0.18            | 0.12            | 0.07            | 0.03            | 0.02            | 0.01            |      |
| 16   | -0.17          | 0.09           | 0.19           | -0.04          | -0.20          | -0.06          | 0.17           | 0.18           | -0.01          | -0.19          | -0.21           | -0.07           | 0.11            | 0.24            | 0.27            | 0.24            | 0.18            | 0.11            | 0.07            | 0.03            | 0.02            | 0.01 |
| 17   | -0.17          | -0.10          | 0.16           | 0.14           | -0.11          | -0.19          | 0.00           | 0.19           | 0.15           | -0.04          | -0.20           | -0.19           | -0.05           | 0.12            | 0.24            | 0.27            | 0.23            | 0.17            | 0.11            | 0.07            | 0.04            | 0.01 |