

TEJ ETRX / Sem-V 18/5/12
EME (REV)

KE
Pending
Examining

N.B. : (1) Question No. 1 is **compulsory**.

(2) Attempt any **four** questions from Q. 2 to Q. 7.

(3) **Vector notation** should be used wherever **necessary**.

(4) **Assumptions** made should be **clearly** stated.

1. (a) Derive wave equation for homogeneous unbounded source free medium starting from Maxwell's equation. 5
 (b) Write a note on Smith Chart. 5
 (c) What is intrinsic impedance of free space? 5
 (d) Explain the significance of the propagation constant and arrive at expressions for its real and imaginary parts for a uniform plane wave. 5
2. (a) Obtain the transmission line equations for a two wire transmission line. Define characteristic impedance of the transmission line. Derive an expression for its characteristic impedance. 10
 (b) Using Smith Chart find the input impedance and reflection coefficient at a point 0.64λ from load $z_L = (75 - j25) \Omega$. Characteristic impedance is 50Ω . 10
3. (a) Explain various types of electromagnetic interferences. 10
 (b) State boundary condition in scalar and vector form. 10
4. (a) Derive Maxwell's equation in integral form. 10
 (b) What is a uniform plane wave? Stating from Maxwell equation, derive wave equation for free space. 10
5. (a) State and explain Poynting vector using modified Ampere's law, derive the Poynting theorem and describe the significance of each of its terms. 10
 (b) Explain potential functions for sinusoidal radiation oscillations. 10
6. (a) Derive the expressions for the reflection and transmission coefficients in case of reflection from perfect dielectric at—
 (i) Normal incidence
 (ii) Oblique incidence. 10
 (b) A lossless 50Ω transmission line is terminated in $25 + j50 \Omega$. Find—
 (i) voltage reflection coefficient
 (ii) current reflection coefficient
 (iii) VSWR
 (iv) impedance at 0.3λ distance from the load. 10
7. Write notes on:— 20
 - (a) Gauss's Law
 - (b) Poisson's equation
 - (c) Impedance Matching.

(3 Hours)

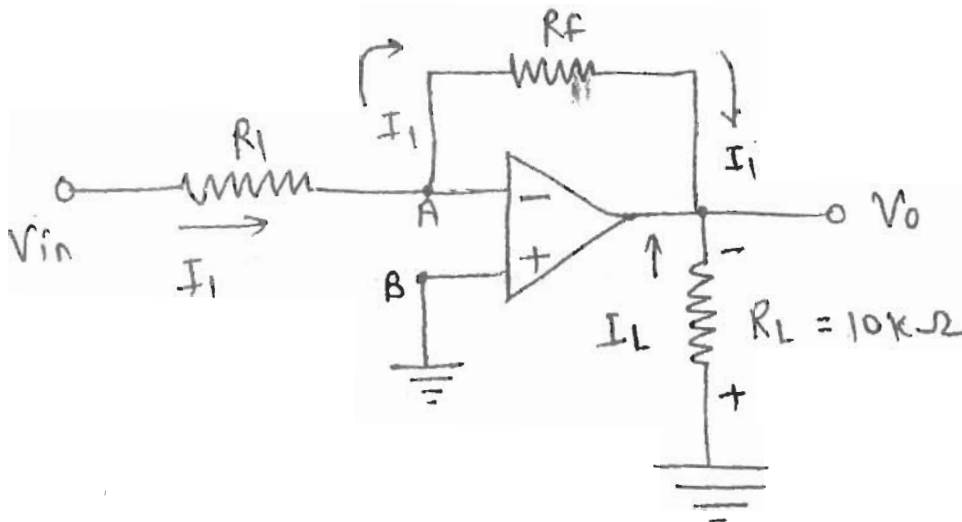
[Total Marks : 100

- N.B.** (1) Question No. 1 is compulsory.
 (2) Solve any **four** questions from remaining **six** questions.
 (3) Assume **suitable** data wherever **necessary**.

1. Solve any **five** :—

20

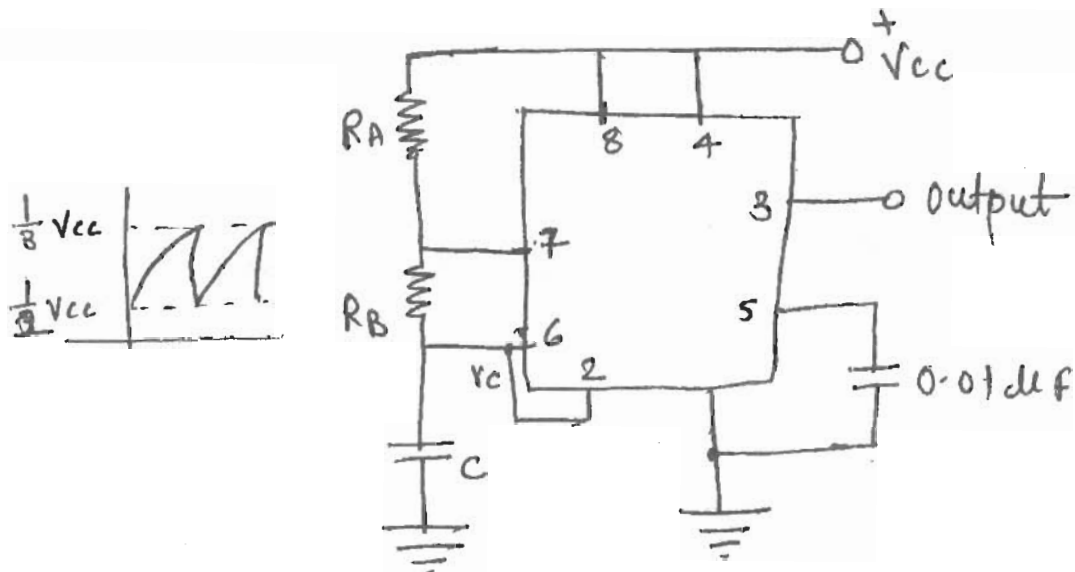
- (a) Explain the operation of a basic differential amplifier.
 (b) Define following parameters of Op-Amp :—
 (i) Input bias current
 (ii) Input offset current
 (iii) Slew Rate
 (iv) CMRR.
 (c) In the **figure**, an inverting amplifier is shown with $R_1 = 20 \text{ k}\Omega$ and $R_f = 100 \text{ k}\Omega$. A load of $10 \text{ k}\Omega$ is connected to the output with input voltage of 0.7 V . Calculate —
 (i) I_1
 (ii) V_o
 (iii) I_L
 (iv) Total current I_o



- (d) Explain about inverting and non-inverting amplifier.
 (e) What is peak detector ?
 (f) List different applications of PLL.
 (g) Explain about V to F converter.
2. (a) Design a practical integrator circuit with a d.c. gain of 10 to integrate a square wave of 10 kHz . 10
 (b) Explain in detail about instrumentation amplifier. 10
3. (a) Explain with design about First Order Low Pass filter. 10
 (b) Explain in detail about :— 10
 (i) Switched capacitor filter
 (ii) KRC filter.

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4. (a) What is Comparator ? Explain in detail about Schmitt trigger. 10
 (b) With neat diagram and waveform, explain in detail about Astable Multi-Vibrator. 10
5. (a) Explain in detail about Successive Approximation method of A to D conversion. 10
 (b) What is the function of Voltage Regulator ? Explain in detail about Fixed Voltage Series Regulator. 10
6. (a) 10



In the above figure, for $R_A = 6.8 \text{ k}\Omega$, $R_B = 3.3 \text{ k}\Omega$ and $C = 0.1 \mu\text{F}$, calculate —

- t_{HIGH}
 - t_{LOW}
 - free running frequency
 - duty cycle D .
- (b) What is RC phase shift oscillator ? Explain in detail. 10
7. Write short notes on any four :— 20
- Current to voltage converter
 - R-2R Ladder DAC converter
 - Phase Locked Loop
 - Sawtooth waveform generator
 - Precision Rectifier.

(3 Hours)

[Total Marks : 100

Q1. is compulsory and solve any four questions from the remaining.

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|----|------|---|----|
| 1. | A. | Explain the reset state of 8085 microprocessor and 8051 microcontroller. | 05 |
| | B. | Explain the CPSR register of ARM 7 processor. | 05 |
| | C. | Explain the terms T state, Machine cycle and Instruction cycle related to 8085 processor. | 05 |
| | D. | Explain RAM memory organization of 8051 microcontroller. | 05 |
| 2. | A. | Design 8085 based system with following specifications | 12 |
| | i) | CPU operating at 3 MHz | |
| | ii) | 16 KB EPROM using 4 KB devices | |
| | iii) | 16 KB SRAM using 8 KB devices | |
| | iv) | One 8 bit input and one 8 bit output port performing simple I/O data transfer in I/O mapped I/O mode. | |
| | | Give its memory mapping and I/O mapping and use exhaustive decoding approach. | |
| | B. | Draw and explain the Timer/Counter block of 8051 microcontroller. | 08 |
| 3. | A. | Explain the following ARM instructions | 10 |
| | i) | ADDEQ R0,R1,R2 | |
| | ii) | MLA R4,R3,R2,R1 | |
| | iii) | TST R2,R3 | |
| | iv) | BLX R0 | |
| | v) | RSB r2,r3,r1, LSL #2 | |
| | B. | Write a program to transmit "HAPPY" serially on Tx pin of 8051 microcontroller with a baud rate of 9600. Assume crystal frequency of 11.0592 MHz. | 10 |
| 4. | A. | Draw and explain the interrupt structure of 8085 processor in detail. | 10 |
| | B. | Write a program to transmit "HAPPY" serially on SOD pin of 8085 processor at a baud rate of 9600. Assume operating frequency of 8085 as 3 MHz. | 10 |
| 5. | A. | Draw timing diagram for JNZ C000 _H instruction. | 10 |
| | B. | With the help of timing diagram explain input data transfer using handshake signals of 8255. | 10 |
| 6. | A. | Interface 16x2 LCD display to 8051 microcontroller and display a single character "H" on it. | 10 |
| | B. | Write a program to generate a square wave of 2kHz using 8155 timer . Timer operates at 3 MHz. | 10 |
| 7. | A. | Explain block diagram of 8259 peripheral IC. | 10 |
| | B. | Explain any two modes of 8253 peripheral IC in detail with the help of timing diagram. | 10 |

TE / ETRX / V (REV) 6/6/12

Digital Commu. & Coding
Techniques
GN-9356

131-2-3 upq-FH KL12 B

Con. 4736-12.

(3 Hours)

[Total Marks : 100

- N.B. :** (1) Question No. 1 is **compulsory**.
(2) Answer any **four** questions out of the remaining **six** questions.
(3) Assume any **suitable** data wherever required but justify the **same**.

1. Answer any **four** questions :

20

- Justify that mean and variance of Poisson distribution are same.
- A 2 kHz Channel has signal to noise ratio of 24 dB. Calculate maximum capacity of this Channel. Assuming constant transmitting power calculate maximum capacity when channel B.W. is halved.
- What is intersymbol interference ? How does it arise and visualize in a communication system ?
- The bit stream 10110110 is to be transmitted using DPSK. Determine the encoded sequence and transmitted phase sequence. Why detection of DPSK doesnot require a differential decoder ?
- What are the various application of spread spectrum system ? Define DS—CDMA.

2. (a) A communication system transmits 5 digits over a noisy channel with per digit error Probability of 0.01. What is the Probability that upto 2 digits will be in error ? Also calculate mean and variance of the error. Use Binomial Probability Distribution.

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(b) A discrete memoryless source has six symbol x_1, x_2, x_3, x_4 and x_5, x_6 with probabilities 0.3, 0.12, 0.12, 0.16, 0.15, 0.15 attached to every symbol.

10

(i) Construct a Shannon-fano code for the source and calculate code efficiency η .

(ii) Repeat (i) for Huffman code and calculate code efficiency η .

(c) Compare the two techniques of source coding on the basis of entropy and code efficiency.

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3. (a) Consider a (8, 4) Systematic block code whose check equation are—

10

$$C_5 = d_1 + d_2 + d_4$$

$$C_6 = d_1 + d_2 + d_3$$

$$C_7 = d_1 + d_3 + d_4$$

$$C_8 = d_2 + d_3 + d_4$$

Where d_n = Message bits

C_n = Parity check bits

t = Ex-OR

- Find the generator matrix and the Parity check matrix for this code.
- List all code words.
- How many errors can be detected and corrected ?

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- (b) Design the generator matrix of $G(\bar{p}) = P^3 + P + 1$ (7, 4) cyclic code and find the code vector for the message $M = (1011)$. 5
- (c) Design the encoder for above question (3, b) and generate code vector for the same message bit $M = 1011$. 5
4. (a) Differentiate between Linear block codes and Convolutional code. 10
A rate 1/3 Convolutional Coder with constraint length of '3' uses the generating vector.
 $g_1 = 100, g_2 = 101, g_3 = 111$
(i) Sketch encoder configuration and prepare the logic table.
(ii) For the input sequence 10111 determine the output data sequence.
- (b) Sketch generalized state diagram and tree diagram for the above question (4 9). 5
- (c) Decode the Received sequence 1101 by using Viterbi algorithm. 5
5. (a) What are the drawbacks of duobinary encoder ? How can they be remedied ? 8
(b) Differentiate between — 8
(i) Orthogonal and Nonorthogonal BFSK
(ii) Offset and Nonoffset QPSK
- (c) Draw the signal space diagram of 8-ary PSK and write the euclidean distance for the same. 4
6. (a) Differentiate between QASK and QPSK. Explain QASK system with its transmitter, receiver and signal space representation. 10
(b) What is a correlation receiver in a coherent communication system ? Derive an expression for the output signal to noise ratio. Is it an optimum receiver ? 10
7. (a) What is Processing gain and jamming margin of spread spectrum system ? Prove that effective jamming power depends upon rate f_c of the PN sequence. 10
(b) Write short notes on the following (any two) :— 10
(i) Fast freq hop spread spectrum system
(ii) MSK (minimum shift keying)
(iii) Lempel Ziv Coding.