

[Time: 3:00 Hours]

[Marks:80]

Please check whether you have got the right question paper.

- N.B:
1. Question 1 is compulsory
 2. Attempt any three out of remaining five questions
 3. Assume suitable data if required
 4. Figures to the right indicate full marks

- Q.1 **Attempt any four :-** (20)
- A. An opamp operates as a unity gain buffer with 3VPP square wave input. If opamp is ideal with slew rate 0.5V/microseconds, find the maximum frequency of operation.
 - B. Draw the circuit diagram of opamp as an averaging amplifier and derive the expression of output voltage.
 - C. Draw the circuit diagram and explain the operation of zero crossing detector.
 - D. Explain specifications of DAC.
- Q.2 A. Draw the circuit diagram and explain the operation of V -I converter, State its application areas. (10)
- B. Design first order low pass filter using opamp at a cut off frequency of 1Khz ,having pass band gain of 2. (10)
- Q.3 A. Draw the circuit diagram and explain the operation of precision full wave rectifier. Derive the expression of output voltage. (10)
- B. Design square wave generator using opamp to have output voltage = ± 5 volts, frequency 1 khz, with 70% duty cycle? (10)
Assume VCC = ± 12 volts.
- Q.4 A. Draw neat circuit diagram and explain the operation of successive approximation type analog to digital converter. (10)
- B. Draw neat circuit diagram and explain the operation of monostable multivibrator using IC 555. (10)
- Q.5 A. Design a IC 555 based symmetrical square wave generator for 1 KHz frequency of Vcc= 5 V. Draw waveforms for voltage across timing capacitor and output.. (10)
- B. Design a 0.5 A current source using IC 7805, for RL = 10 ohms.? (10)
- Q.6 Solve any Notes on any **TWO** of the following:
- A. Functional block diagram and working of IC 723. (10)
 - B. Schmitt trigger and its applications. (10)
 - C. RC phase shift oscillator using opamp (10)

Duration: 3 Hours**Marks: 80**

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

(2) Attempt any three questions from remaining questions.

(3) Figures to the right indicate full marks.

Q1)

- a) Explain the SFR's required for Serial Communication in 8051. 5
- b) Explain the CPSR Register of ARM 7. 5
- c) Explain the ARM 7 pipeline Mechanism. 5
- d) Draw the Memory Map of 8051 internal RAM. 5

- Q2) a) Explain in detail the ARM Processor operating Modes. 10
- b) Write a program to transfer "Hello" serially using 8051 with a baud rate of 9600. 10

- Q3) a) Explain the Interrupt Structure of 8051 using the appropriate Registers. 10
- b) Write 8051 based assembly Program to generate a square wave on P1.0 of 10Khz frequency and 50% duty cycle . 10

- Q4) a) Explain the following 8051 instructions. 10
- a) MOV A,@R0 b)MOVC A,A+@DPTR c)ANL A,@R0 d)ADDC A,25H
- b) Explain the following ARM7TDMI architecture based instructions 10
- i)TST r2,r5 ii)LDR R0,[r1+r2] iii)MVN r0,r2,LSL 2 iv)CMP r0,r1

- Q5) a) Explain the programmers Model (Register structure) in ARM7. 10
- b) Explain the different addressing modes in 8051 with suitable examples. 10

Q6) Write Short Notes on any 2

- a) Stepper Motor Interfacing with 8051. 10
- b) Timer and Counter operation of 8051 10
- c) 8 bit ADC interfacing with 8051. 10

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

2) Attempt **any three** questions out of the remaining five questions.

3) Assume suitable data wherever necessary.

1. Answer the following (any four): 20
 - a) Let $\epsilon_r = 5, \mu_r = 4$ and $\sigma = 0$. If the displacement current density is $20 \cos(1.5 \times 10^8 t - \beta x) \vec{a}_y$ $\mu\text{A}/\text{m}^2$. Find \vec{D} , and \vec{E} .
 - b) For a wave propagating in z-direction, prove that $\vec{E} \cdot \vec{H} = 0$ and $\vec{E} \times \vec{H}$ gives the direction of propagation.
 - c) An electromagnetic wave propagating in a perfect dielectric is normally incident on a perfect dielectric. Derive the reflection and transmission coefficient for the reflected wave.
 - d) Explain the concept of retarded potential.
 - e) Explain ground wave propagation. State its applications.

2.
 - a) What is polarization? Explain different types of polarization. 10
 - b) Derive the reflection coefficient for a wave with oblique incidence having perpendicular polarization, reflected from a perfect dielectric. 10

3.
 - a) State and prove Poynting theorem. Give interpretation of each power term. 10
 - b) Explain in detail FDM method and state its advantages and drawbacks. 10

4.
 - a) Derive the expression for the radiated power for a hertzian dipole. 10
 - b) Define critical frequency, MUF and OMF. A high frequency radio link has to be established between two points on the earth 2500km away. If the reflection region of the ionosphere is at a height of 200km and has a critical frequency of 12MHz, calculate the MUF of the given path. 5
 - c) Find the average and maximum radiation intensity, U_{ave} and U_{max} respectively and the directivity, D if $U(\theta, \phi) = 4 \cos^2 \theta$, $\pi/3 < \theta < \pi/2$, $0 < \phi < \pi$. 5

5.
 - a) Derive boundary conditions for electric and magnetic fields at dielectric-dielectric boundary. 10
 - b) What is line of sight propagation? Obtain an expression for the range of line of sight for space wave propagation in terms of antenna's transmitting and receiving heights. 5

6. Write short note on:
 - a) Folded dipole antenna 5
 - b) Poisson's and Laplace's equations 5
 - c) Wave equations for time harmonic fields 5
 - d) Interpretation of Maxwell's equations in integral form 5

- N. B.: 1) Question No. **1** is **compulsory**.
 2) Attempt **any three** questions out of the remaining five questions.
 3) Assume suitable data wherever necessary.

1. Answer the following (any four): 20
- State and explain central limit theorem.
 - Show that the mean of the sum of random variables is the sum of the means of the random variables.
 - Consider the five messages given by the probabilities $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{16}$. Calculate average information and information rate if $r=1$ messages per second.
 - The binary data 1101101011 is applied to the input of a duo-binary system with a pre-coder. Draw the duo-binary encoder and construct the encoder output.
 - For the binary sequence 1011001101 draw the following line codes: i) NRZ, ii)RZ, iii)AMI, iv)RB, v) bi-phase M.

2. a) A discrete memory less source has an alphabet of five symbols with their probabilities a shown below: 12

Symbol	S1	S2	S3	S4	S5
Probability	0.19	0.22	0.10	0.38	0.11

- Construct Huffman code for each symbol and determine the following parameters:
 Entropy, Average code word length, code efficiency and code redundancy.
 - Determine the above parameters for Shannon-Fano code.
- b) Discuss the causes of ISI and ways to overcome it. Also state and explain the Nyquist condition for zero ISI. 8
3. a) The generator vectors for a convolutional encoder with code rate $1/3$ are $g_1=111$, $g_2=101$ and $g_3=110$. 10
- Draw the encoder diagram and determine the code word for the input vector (11010)
 - Draw trellis diagram and state diagram.
- b) A (7, 4) cyclic code is generated using the polynomial $g(x)=(1+x+x^3)$. Find the code word if the data word is i) 0011, ii) 0100(MSB) by long division method. Draw the encoder and generate the code word for the same data tracing the path through the encoder. 10
4. a) What is spread spectrum modulation? Explain FHSS giving appropriate diagrams 10
- b) With a neat diagram, explain the working of the Integrate and Dump receiver. Derive the expression for its probability of error. 10

- 5. a) Draw the signal constellation for 16-QASK and hence find its Euclidean distance. Compare it with the Euclidean distance of 16-QPSK. 10
- b) For the bit sequence 101010011010 draw the MSK waveform. 5
- c) If the direct sequence spread spectrum system has the following parameters: 5
 - Data sequence bit duration, $T_b=6.125\text{ms}$,
 - PN chip duration, $T_c= 1.5\mu\text{s}$,
 - The probability of error is less than 10^{-5} ; ($E_b/N_0=10$)Then calculate the Processing gain and Jamming Margin.

- 6. Write short notes on:
 - a) Expression for PSD of NRZ data 5
 - b) Eye pattern and its significance 5
 - c) Significance of AWGN channel 5
 - d) Desirable properties of line code 5

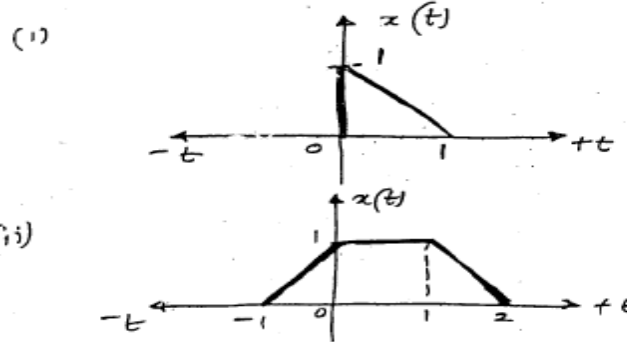
(3 Hrs)

Total Marks: 80

- NOTE :**
- 1) Question number 1 is compulsory.
 - 2) Attempt any three questions from the remaining five questions.
 - 3) Assume suitable data wherever necessary.

- Q1**
- a Check whether the following systems are linear, time variant, causal or otherwise: (5)
 - i) $y(n) = x(n) + n * x(n-1)$
 - ii) $y(t) = x(t) + 3 x(t+4)$
 - b What is autocorrelation and cross correlation? How is it related to ESD and PSD? (5)
 - c Find the convolution of the sequences $x_1(n) = x_2(n) = \{1, 1, 1\}$ using convolution property of Fourier transform. (5)
 - d Verify periodicity of the following continuous time signals. If periodic, find the fundamental period. (5)
 - (i) $x(t) = 2 \cos(t/4)$
 - (ii) $x(t) = e^{-j2\pi t/7}$

- Q2**
- a Determine power or energy of the following continuous time signal: (5)
 - (i) $x(t) = e^{-2t} \cdot u(t)$
 - (ii) $x(t) = 3 \cos(5\pi t)$
 - b Obtain Laplace transform by using properties of Laplace transform only. (10)



- c Explain Gibb's phenomenon. (5)

- Q3** a Find the natural response of the system described by the equation (10)

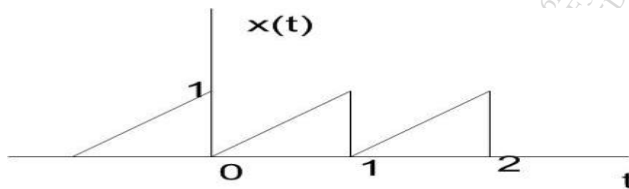
$$\frac{d^2y(t)}{dt^2} + 6 \frac{dy(t)}{dt} + 5y(t) = \frac{dx(t)}{dt} + 4x(t) ;$$

$$\text{for } y(0) = 1 ; \left. \frac{dy(t)}{dt} \right|_{t=0} = -2$$

b Consider the analog signal $x(t) = 5 \cos 50\pi t + 2 \sin 200\pi t - 2 \cos 100\pi t$. Determine the minimum sampling frequency and the sampled version of analog signal at this frequency. Sketch the waveform and show the sampling points. Comment on the result. **(10)**

Q4 a Convolve the following two signals in time domain and sketch the output: **(10)**
 $X(t) = 2(t) * [u(t+2) - u(t-2)]$, $h(t) = u(t) - u(t-4)$

b Determine the exponential Fourier series of the given signal: **(10)**

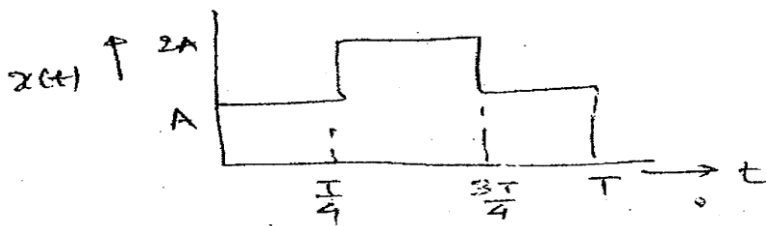


Q5 a Determine inverse Z transform for the following functions: **(10)**

$$X(z) = \frac{1+z^{-1}}{1-z^{-1}+0.5z^{-2}}$$

$$X(z) = \frac{1}{(1+z^{-1})(1-z^{-1})^2}$$

b Obtain Fourier transform by using properties of Fourier transform only. **(10)**



Q6 a State Initial and Final value theorem of Z-transform and Laplace transform. **(5)**

(5)

b) Prove that Energy of a power signal is infinite and Power of an Energy signal is Zero. **(5)**

(5)

c) Determine $h(n)$ for all possible ROC conditions. **(10)**

(10)

$$H(z) = \frac{z(z^2 - 3z + 11)}{(z - \frac{1}{4})(z - 4)(z + 6)}$$
