Time:-3 Hours **Marks:-80**

N.B: 1) Question No 1 is Compulsory
2) Attempt any 3 questions from remaining questionsa

Q1) a) Justify why the ports of 8051 are initialised to FFH when operating in input Mode. (5)
b) Explain the ARM 7 Pipeline Mechanism and give its advantages ,disadvantages over ARM 9 Pipeline. (5)
c) Explain the significance of Gate Pin in 8051 (5)
d) Explain Idle mode and Power down mode of 8051. (5)

Q2)a)Write a program to generate a square wave with duty cycle 10ms.
Crystal Frequency =11.0592 MHz (10)
b) Write a Program to Transmit message "welcome " serially at 9600 Baud Rate .
Show the Baud Rate Calculation. (10)

Q3 a) Draw the ARM7 Register Model and Explain its operating Modes with suitable examples (10)
b) Explain the following ARM7 instructions (10)
i) LDMIA r0 !,{r1-r3}

PRE Values are

r0=0x00080010 mem32[0x00080018]=0x00000003
r1=0x00000000 mem32[0x00080014]=0x00000009
r2=0x00000000 mem32[0x00080010]=0x0000000A
r3=0x00000000

Write the POST values

ii) STMFD !,{r1,r4}
mem32[0x00080018]= 0x00000003 r1=0x00000002
mem32[0x00080014]= 0x00000009 r4=0x00000003
mem32[0x00080010]= empty
mem32[0x0008000C]= empty

iii) MRS r1,cpsr iv) ADD r0,r3,r4 LSL #4

Q4a) Explain the Interrupt structure of ARM7. (10)
b) Explain the interrupt structure of 8051 and related registers used (10)

Q5) a) Write a Program to display the message Temperature on LCD. (10)
b)Write a Program to Rotate a Stepper Motor continuously using 4 step sequence. (10)

Q6) Interface 32K RAM (using 16 K) and 32 K ROM (using 16k) to 8051.Show the Memory Map ,Clock circuitry ,Reset circuitry and other interfacing signals. (20)

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Time: 3 Hours **Max. Marks: 80**

Note: (1) Question number 1 is compulsory.
(2) Solve any THREE out of remaining.
(3) Assume suitable data if necessary.
(4) Figures to the right indicate full marks.

Q.1 Attempt any **FOUR**

(a) Derive Laplace's and Poisson's equations. **(5)**

(b) Explain ground wave propagation. Which type of polarization is used for ground wave? **(5)**

(c) Explain the Dirichlet-type, Neumann-type and mixed boundary conditions. **(5)**

(d) Explain the radiation intensity, directivity and directive gain of the antanna. **(5)**

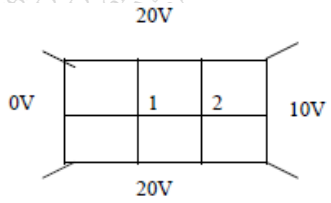
(e) State and explain Coulomb's law. Point charges 1mC and -2mC are located at (2,3,-1)m and (- 2,-1,4)m respectively. Calculate the electric force on a 10nC charge located at (0,3,1)m. **(5)**

Q. 2 **(a)** Derive Maxwell's equation in integral & Point form for time varying field. **(10)**

(b) Define and explain skin depth. Derive the expression for the skin depth. Calculate the skin depth and the velocity of propagation for a uniform plane wave at a frequency of 150MHz traveling in aluminum. ϵ_r=1, μ_r=1, σ=3.5x10^7 S/m. **(10)**

Q.3 **(a)** Explain Poynting vector. Derive Poynting theorem and describe significance of each term. **(10)**

(b) Use the finite difference method to calculate the potentials at nodes 1 and 2 in the potential system shown in figure using iteration method and band matrix method. **(10)**



Q.4 **(a)** Derive the expression for radiation resistance in far field region of an infinitesimal dipole. **(10)**

(b) Find the directive gain and D if $U(\theta,\phi) = 10\sin\theta\sin^2\phi$, $0<\theta<\pi$, $0<\phi<2\pi$. **(5)**

(c) An antenna has a field pattern given by $E(\theta) = \sin^2 2\theta$ for $0<\theta<\pi$. Find the half power beamwidth and the first null beamwidth.

Q.5 **(a)** Explain sky wave propagation. **(5)**
Calculate the skip distance for flat earth with MUF of 20 MHz if the wave is reflected from a height of 200km where the maximum value of refractive index of the earth is 0.95.

(b) What is line of sight propagation? Obtain expression for range of line of sight for space wave propagation in terms of antenna's transmitting and receiving heights. **(10)**

Q.6 Attempt any **TWO**

(a) Explain folded dipole antenna and its applications. **(10)**

(b) Explain the concept of retarded fields. **(10)**

(c) Derive the expressions for propagation constant, attenuation constant, phase-shift constant, velocity and intrinsic impedance for a wave propagating in a perfect conductor. **(10)**

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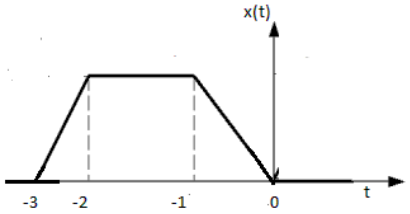
(3 Hrs) **Total Marks: 80**

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

Q.1] Answer following questions.(any four)

a) A continuous time signal is shown in Figure. Draw following version of the signal. (5)
(i) x(t-2) (ii) x(-t+2)



b) Perform the following convolution (5)
x(n)= u(n)-u(n-4)
v(n)= $(0.5)^n$ u(n)

c) Determine the Laplace transform of (5)
x(t)= cos(Ωo t) u(t)

d) Find the initial value and final values of (5)

$$x(z) = \frac{2z^{-1}}{1 - 1.8z^{-1} + 0.8z^{-2}}$$

e) Find the Fourier transform of x(n)={2, 1, 2} (5)

Q2] a) Test whether the following system is linear and causal? (4)
(i) $y(t)= 4x(t)+\frac{dx(t)}{dt}$ (ii) y(t)=x(-t)

b) consider a sinusoidal signal (8)
x(t)= 3 cos(1000 πt+0.1 π)
and let sampling frequency be Fs= 2 KHz.
(i) Determine the expression for the sampled sequence x(n)=x(nTs) and determine its discrete time Fourier transform x(ω)= DTFT [x(n)]
(ii) Determine The Fourier Transform X(F)= FT(x(t))
(iii) Recompute x(ω) from X(F) and verify that you obtain the same expression as in (i)

c) Determine the natural response of the first order system governed by the equation (8)
$\frac{dy(t)}{dt} + 3y(t) = x(t);\ \ y(0) = 2$

Q3] a) Determine the inverse Z Transform of (10)

$$X(z)= \frac{1}{1-0.8z^{-1}+0.12z^{-2}}$$

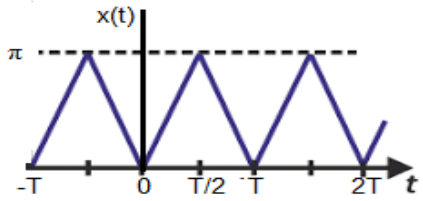
(i)If ROC is |z|>0.6 (ii) ROC is |z|<0.2 (iii) ROC is 0.2<|z|<0.6

b) Compute the DFT of the sequence
x(n) ={0, 1, 2, 3}. Sketch the magnitude and phase spectrum. (10)

Q4] a) State and prove initial and final value theorem of Laplace Transform and Z Theorem (10)

b) Determine the energy in the signal $f(t)= u(t)\, e^{-t}$ (10)
(i) in the time domain
(ii) by finding energy density spectrum and integrating over frequency.

Q5] a)Find the Fourier series of the waveform shown below: (10)



b) The impulse response of the continuous time system is given by (10)
$h(t)= e^{-5t}\, u(t)$. Determine the unit step response of the given system using convolution theorem of Laplace transform.

Q6] a) Explain Gibb's phenomenon (5)
b) Determine the autocorrelation function and energy spectral density of (5)
$x(t)=e^{-at}\, u(t)$
c) Determine the inverse Laplace transform of (10)

$$X(S) = \frac{1}{(s+1)(s^2+s+1)}$$

(3 Hours) Marks: 80

N.B.

1) Question number ONE is compulsory.

2) Attempt any THREE questions from remaining questions.

3) All questions carry equal marks.

Q1

a) Show that the mean of the sum of random variables is the sum of the means of the random variables. 5

b) Compare QPSK and QASK 5

c) Explain Binary Symmetric Channel 5

d) Derive the condition for maximum entropy of a source. How does entropy vary with probability. 5

Q2 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) With reference to 8-PSK explain transmitter and receiver with neat block diagram along with mathematical expression for transmitted signal. Draw constellation diagram and find its Euclidian distance. 10

Q3 a) A discrete memory less source has an alphabet of five symbols with their probabilities a shown below:

Symbol	S1	S2	S3	S4	S5
Probability	0.4	0.19	0.15	0.15	0.11

i) Construct Huffman code for each symbol and determine the following parameters: Entropy, Average code word length, code efficiency and code redundancy.

ii) Determine the above parameters for Shannon-Fano code. 10

b) Explain FHSS giving appropriate diagrams. If the direct sequence spread spectrum system has the following parameters:
Data sequence bit duration, T_b=6.125ms, PN chip duration, Tc= 1.5μs, The probability of error is less than 10^{-5}; (E_b/N_0=10), then calculate the Processing gain and Jamming Margin. 10

Q4 a) Explain the necessity of line codes. State different types of line codes. Plot power spectral density of NRZ signal. 10

b) Explain Duo binary encoder-decoder with a neat sketch. What is significance of precoder in it? 10

Q5 a) Draw block diagram of BPSK transmitter and receiver and explain. Sketch signal space diagram and PSD of BPSK. 10

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

Q6 Write short notes on following 20

a) AWGN Channel
b) Inter Symbol Interference
c) Eye Pattern
d) Matched Filter

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Time: 3 hours **Marks: 80**

N.B: 1. Question No 1 is compulsory

2. Answer any three from the remaining.

1. Attempt any four from the following. (20M)

(a) Explain 78XX series voltage regulator.

(b) State various methods to achieve analog to digital conversion.

(c) Design RC phase shift oscillator to produce sinusoidal output of 5KHZ.

(d) Compare zero crossing detector with Schmitt trigger circuit.

(e) what is difference between normal rectifier & precision rectifier. Explain half wave inverting rectifier.

2.(a) Explain function of each block of PLL? (10M)

(b) Explain triangular wave generator to get the output frequency at 1.5 kHz and vo (p-p) = 7.5 v using op-amp. (10 M)

3.(a) Explain waving R/2R ladder D/A convertor. (10M)

(b) Explain internal diagram of power amplifier LM 380. (10 M)

4. (a) Design 2nd order KRC low pass filter (LPF) for cut off frequency fo=10khz with quality factor Q=5. (10M)

(b) Draw and explain functional block diagram, working of IC 723. (10 M)

5. (a) Derive expression for voltage gain of inverting amplifier and hence design the same for voltage gain =20. (10M)

(b) what are the features of instrumentation amplifier, draw neat diagram of three op-amp instrumentation amplifier and hence derive equation of output voltage. (10M)

6. Answer any four (20 M)

(a) Ideal and practical characteristics of op-amp IC 741.

(b) Define following: Slew Rate, CMRR, PSRR

(c) window detector

(d) V to I convertor

(e) Sample and Hold circuit

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