Q.P. Code : 22684

[Time: 3 Hours] **[Marks: 80]**

Please check whether you have got the right question paper.

N.B:
1. Questions no. 1 is compulsory solve any three from remaining questions.
2. Solve any three from remaining questions.
3. Assume suitable data if necessary but mention the same.
4. Figures to the right indicate full marks.

1. Answer the following -

a) Explain why open loop configuration is unsuitable for linear applications of OPAMP? Which type of feedback is used for linear applications of OPAMP. **05**

b) Explain in detail one application of comparator. **05**

c) Draw the circuit diagram and explain the operation of Voltage to current converter. **05**

d) Explain specifications of ADC and DAC. **05**

2. a) Design triangular wave generator for Vopp = 7 V, Fo = 2 khz. Use 741 OPAMP with supply voltage = + /- 15 V. **10**

b) Draw the circuit diagram and explain the operation of sample and Hold circuit. State its applications. **10**

3. a) Draw the block diagram and explain the operation of PLL. State its applications. **10**

b) i) Define input offset voltage, slew rate, thermal drift. **06**

ii) A 741 OPAMP is used as an inverting amplifier with Rl = 1 K and R f = 100K. what is the maximum output offset voltage caused by input offset voltage Vios. For 741 OPAMP Vios = 6 mill volts. **04**

4. a) Design the voltage regulator using IC 723 to give Vo = 3 V. **10**

b) Design second order Butterworth low pass filter having upper cutoff frequency = 1 KHz. Sketch its frequency response characteristics. . **10**

5. a) Draw the circuit diagram and explain the operation of astable multivibrator using IC 555. Explain methods to obtain square wave output. **10**

b) i) Calculate output voltage produced by DAC having output voltage range 0-10 V and whose binary number is- 10(for 2 bit DAC), 0110 (for 4 bit DAC), 10101010(for 8 bit DAC) **03**

ii) Explain the operation of successive approximation type ADC. **07**

6. Write short notes on the following (any four). **20**

a) Practical determination of OPAM P parameters
b) Full wave precision rectifier.
c) VCO IC 566.
d) Switching voltage regulator
e) Logarithmic amplifier.

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Instructions:

1) Question number 1 is compulsory.
2) Answer any three questions from remaining question
3) Assume Suitable data if required but justify the same.

Q1. Answer any four questions

1) With neat block diagram explain Digital Communication System.

2) Differentiate between MSK and Offset QPSK.

3) State and Explain Shannon's theorem for channel capacity.

4) Explain the terms code redundancy, code rate, code efficiency and Hamming Bound.

5) Differentiate between Frequency hopped spread spectrum(FHSS) and Direct sequence spread spectrum.

Q2. 1) Explain with neat diagram, transmitter. Receiver, waveforms, the BPSK modulation System.

2) A discrete memoryless channel has an alphabets of five symbols, with the probabilities as As given below

S1	S2	S3	S4	S5
0.55	0.15	0.15	0.1	0.05

Construct the Huffman code and find entropy and average code word length of the code. Also calculate code redundancy and efficiency of the code.

Q3. 1) A (7,4) linear block code has following generator matrix

$$G = \begin{matrix} 1\ 1\ 0 & 1\ 0\ 0\ 0 \\ 0\ 1\ 1 & 0\ 1\ 0\ 0 \\ 1\ 1\ 1 & 0\ 0\ 1\ 0 \\ 1\ 0\ 1 & 0\ 0\ 0\ 1 \end{matrix}$$

i) Write parity check matrix
ii) Generate all the code word
iii) Generate the decoding table for the single error pattern.

2) Explain DPSK system with respect to transmitter. Receiver

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Q4. 1) Explain with neat diagram the working of Integrate and Dump receiver. Derive the expression for probability of error.

2) Explain with neat diagram frequency hopping spread spectrum, FH-MFSK and explain slow hopping and fast hopping.

Q5. 1) What is Eye pattern. Explain the parameters observed from it with an illustration.

2) Draw signal space diagram for 16 QAM system and compare probability of occurrence of error in it with QPSK system.

Q6. Write short notes on followings(any two)

1) Nyquist criteria for distortion less baseband transmission
2) Convolution codes
3) Direct sequence code division multiple array(DS-CDMA)
4) Probability Models

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Time : 3 hours Marks : 80

Note

a. **Q.1** is compulsory

b. Solve **any 3** questions out of the remaining questions

c. Figures to the right indicate full marks

Q.1 **Solve any 4**

a. Explain significance of Thumb mode of operation in ARM7 TDMI 5

b. Explain any 5 addressing modes of 8051 5

c. Explain following instructions in 8051

i) DA A ii) ANL A, Rn iii) INC direct iv) JNZ rel v) CJNE A, direct, rel 5

d. Write a C/assembly language program to add 10 bytes in internal RAM. 5

Assume starting location of the block is 50H.assume sum to be 8 bit.

Store the result in register R0 of bank1.

e. Explain CPSR register in ARM7TDMI 5

f. Explain TCON register in 8051 5

Q.2 a. Draw and explain interfacing of 8 bit ADC to 8051 10

b. Write a C/assembly program to transfer message “GOOD” using serial 10

communication of 8051 at 9600 baud rate .oscillator frequency is 11.0592 MHz.

Q.3 a. Interface a Hex Keypad to 8051 and explain logic for key detection 10

b. Interface following memory components to 8051 10

i) 32 KB RAM using 16KB devices

ii) 32 KB ROM using 16 KB devices.

Q.4a. Explain various operating modes of ARM7 TDMI processor. 10

b. Write a program for 8051 microcontroller to generate a square wave of 1khz 10

on port pin P1.2 using timer 1 interrupt .Assume crystal frequency of 12KHz

Q.5 a. Explain various addressing modes in ARM7 TDMI 10

b. Explain various timer modes in 8051 10

Q.6 Write short notes on any 4 20

a. Interrupts in 8051 microcontroller

b. Power saving modes in 8051

c. Interrupts/exception support in ARM7TDMI

d. SFR's in 8051

e. Memory organization in 8051 microcontroller

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

N. B. 1) Question No. 1 is compulsory.
2) Attempt any three questions out of the remaining five questions.
3) Figures to the right indicate full marks.
4) Assume suitable data wherever required but justify the same.

1. Attempt any **four**:
   a. State and explain Gauss's law. 5
   b. Explain the concept of skin depth. 5
   c. Define critical frequency and angle of incidence. Derive an expression for critical frequency in terms of ionization density. 5
   d. Explain the concept of retarded potential. 5
   e. Define radiation intensity, directive gain and directivity with respect to an antenna. 5

2. a. Derive Maxwell's equations in point and integral form for time varying fields. 10

   b. A boundary exists at z = 0 between two dielectrics, ϵ_r=2.5 for region 1and for region 2 ϵ_r is 4 for z > 0. The electric field for region 1 is 10

$$\bar{E}_1 = -30\bar{a}_x + 50\bar{a}_y + 70\bar{a}_z V/m.$$

   Find:- (i) Normal component of $\bar{E}_1$ (ii) tangential component of $\bar{E}_1$ (iii) angle θ_1 between $\bar{E}_1$ and normal to the surface (iv) normal component of $\bar{D}_2$ (v) tangential component of $\bar{D}_2$ (vi) angle θ_2 between $\bar{D}_2$ and normal to the surface 10

3. a. Define Polarization of a wave. Explain different types of polarization in detail. 10
   b. State Poynting theorem. Derive the Poynting vector and derive the power terms involved in the derivation. 10

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4. a. Differentiate between FDM, FEM and MOM. 10
   b. Derive an expression for the radiation resistance of an infinitesimal dipole antenna 10

5. a. Explain the radiation patterns, half power beam width, first null beam width, antenna efficiency and effective length of an antenna. 10
   b. Explain various factors affecting field strength of a space wave signal. 10

PTO ….

6. a. Define wave tilt. Explain ground wave propagation in detail. 10

b. Define OWF and MUF. Derive the expression of MUF in terms of critical frequency and virtual height. A high frequency communication link is to be established between two points on the earth 2000 km away. If the reflection region of the ionosphere is at a height of 200 Km and has a critical frequency of 5 MHz, Calculate MUF for the given path. 10

(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) Determine the values of power and energy for the following signals: (20)

i) $x_1(t) = e^{j(2t+\pi/4)}$ ii) $x_2(n) = (1/2)^n u(n)$.

(b) Check whether the given systems are time-variant, linear and causal:

i) $y(t)= x(t) +dx(t)/dt$ ii) $nx(n)$

(c) Check for periodicity of the given signals .Also determine the fundamental period.

i) $x(t)= 2 \cos (10t+1) – \sin (4t-1)$ ii) $x(n) = e^{j7\pi n}$

(d) Find the correlation of the two sequences , $x(n) =\{1,2,3\}$ and $y(n) =\{2,4,1\}$.

Q2(a) Determine x(n) for all possible ROC conditions. (10)

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

(b) Perform convolution of the following causal signals (10)

(i) $x_1(t)= e^{-2t} . u(t)$, $x_2(t)= e^{-5t} . u(t)$

(ii) $x_1(t)= t\, u(t)$, $x_2(t)= e^{-5t} u(t)$

Q3 (a) A Discrete time LTI system is specified by

$y(n) = -7y(n-1) – 12y(n-2) + 4 x(n-1) -2 x(n)$ (10)

$y(-1) = -2$ $y(-2) = 3$

Determine (a) zero input response

(b) zero state response if $x(n) = (6)^n u(n)$

(c) Total response of the system

(b). A continuous time LTI system for which the input x(t) and output y(t) are related by the differential equation : (10)

$$\frac{d^2y(t)}{dt^2} - \frac{dy(t)}{dt} - 2y(t) = x(t) \ ;$$

(i) Determine H(s) as a ratio of two polynomials in s. Sketch the pole-zero pattern of H(s).

(ii) Determine h(t) for each of the following cases :

1. The system is stable.

2. The system is causal.

3. The system is neither stable nor causal.

Q4 (a) Using Laplace transform determine the complete response of the system described by the equation , (10)

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

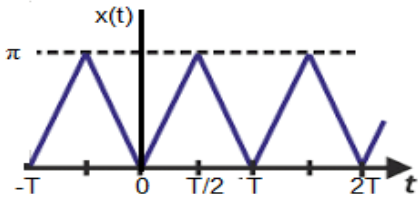
$y(0) = 0$; $dy(t)/dt\,|_{t=0} = 1$, for the input $x(t) = e^{-2t}u(t)$.

(b) Determine the Fourier transform of the given continuous time domain signal given by

$x(t) = e^{-at}\cos\Omega_o\, u(t)$ (5)

(c) Define ESD and PSD .What is the relation of ESD and PSD with autocorrelation ? (5)

Q5 (a) Determine the Fourier series of the given signal: (10)



(b) Prove time shifting property of Z transform. (5)

(c) Determine the impulse response for the cascade of two LTI systems having impulse responses $h_1(n) = (1/2)^n u(n)$ and $h_2(n) = (1/4)^n u(n)$. (5)

Q6(a) Compute the Fourier transform and sketch the magnitude and phase function of causal sequence given by : $x(n) = 1/3$; $0 \le n \le 2$ (10)

$= 0$; else

(b) State and prove Initial and final value theorem. Determine the initial and final values of x(t) if its Laplace transform is given by : $X(s) = \frac{10\,(2s+3)}{s(s^2+2s+5)}$ (10)

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