

Question bank of DSP (6th ETC)
(Introduction to signal & system)

Chapter - 01

- 1) What is sampling and define sampling theorem.
- 2) Define Nyquist rate.
- 3) Write the application of signal processing.
- 4) Differentiate digital signal with discrete signal.
- 5) What are continuous time and discrete time signal.
- 6) What is Nyquist rate? find the Nyquist rate for the given analog signal
$$x(t) = 5 \cos 50\pi t + 10 \sin 300\pi t - 5 \cos \pi t.$$
- 7) Write down the advantages of DSP over ASP.
- 8) Explain the digital signal processing system with neat block diagram.
- 9) Define signal and system.
- 10) Differentiate between one dimensional signal & multidimensional signal with example.
- 11) Define quantization and quantization error.
- 12) Explain the process of analog to digital conversion.

[Signature]

CHAPTER-02 (Discrete Time Signal & Systems)

1) Define discrete time signal & Represent

$x(n) = \{1, 2, 3, 1, 2\}$ in different representation of discrete time signal.

2) Define the following signals.

a) Unit sample sequence b) Unit step signals.

c) Unit ramp signal d) Exponential signal.

3) Define Energy and Power signals.

4) Determine the power and energy of unit step signal or $x(n) = u(n)$

5) Determine whether the signal $x(n) = \left(\frac{1}{2}\right)^n u(n)$ is a energy or power signal.

6) Determine the power and energy of $x(n) = e^{j\left[\frac{\pi n}{2} + 1\right]} u(n)$ and find whether $x(n)$ is a energy or power signal.

7) Determine whether the following signals are periodic or not, also find the fundamental period.

a) $x(n) = e^{j6\pi n}$ b) $x(n) = \sin 15\pi n$ c) $e^{j7\pi n}$.

d) $x(n) = \sin 5\pi n + \sin 20\pi n$ e) $\cos\left[\frac{n}{8} - \pi\right]$

8) Find even and odd part of the signal

a) $x(n) = A \sin \omega n$ b) $x(n) = \{1, \underset{\uparrow}{2}, 1, 0, 2, 1\}$

c) $x(n) = (\sin \omega n + 1)^2$

9) Find the even and odd part of the signal
 $x(n) = \{-2, 1, 2, 5, 0, 0, 1, 6, 3\}$
 \uparrow

10) Define following discrete time signal with example.
a) Energy and power signal b) periodic & aperiodic signal
c) symmetric & asymmetric signal d) causal & non causal signal.

11) Using basic building blocks, sketch the block diagram representation of the discrete time system described by input-output relation.

a) $y(n) = 5y(n-1) + x(n) + 2x(n-1)$

b) $y(n) = 4x(n) + 6x(n-1) + 4x(n-2) - 2y(n-1)$

c) $y(n) = 2y(n-1) + 3y(n+1) + x(n) + \frac{1}{2}x(n+1) + \frac{1}{4}x(n-2)$

Where $x(n)$ is the input and $y(n)$ is the output sequence.

12) Define following discrete time signal with example.

a) Static and dynamic systems.

b) causal & non causal systems.

c) Time invariant & time variant systems.

d) Linear & non linear system.

e) stable & unstable system.

13) Examine whether the systems are static or dynamic.

a) $y(n) = \cos[x(n)]$ b) $y(n) = x(n) + nx(n+1)$
c) $y(n) = x(2n)$

14) Determine if the system described below are causal or non-causal

a) $y(n) = x(n) - x(n-1)$ b) $y(n) = x^2(n)$ c) $y(n) = x(n^2)$
d) $y(n) = x(-n)$

15) Test whether the systems are causal or non-causal

a) $y(n) = x(n) + x^2(n-1)$ b) $y(n) = \sum_{k=-\infty}^{n+1} x(k)$
c) $y(n) = x(-n)$

16) Determine if the systems are time-invariant or time-variant.

a) $y(n) = x(n) - x(n-1)$ b) $y(n) = x(-n)$ c) $y(n) = nx(n)$
d) $y(n) = \cos[x(n)]$

17) Determine if the system described by the following input-output equation are linear or non-linear.

a) $y(n) = nx(n)$ b) $y(n) = x^2(n)$ c) $y(n) = x(2n)$

18) Determine the stability of the system whose impulse response is given by

a) $h(n) = 2^n u_L(n)$ b) $h(n) = \sin \frac{n\pi}{2}$

19) Explain recursive & Non-recursive discrete time system with Example.

20) State properties of discrete convolution.

21) Give a block schematic of the system having the following input-output relationship $y(n) = x(n) + a y(n-1) + b y(n-2)$, How many additions and multiplications are performed per sample.



CHAPTER-03 (Z-transform & Its application to LTI system)

- 1) Define ROC.
- 2) Determine the Z-transform of the following signals.
 - a) $x(n) = \{1, 2, 3, 4, 0, 5\}$
 - b) $x(n) = \{2, 3, 1, 2, 5, 6\}$
 - c) $x(n) = \delta(n)$
 - d) $x(n) = \delta(n-k)$, $k > 0$.
- 3) Determine the Z-transform and ROC of the signal
 - a) $x(n) = a^n u(n)$
 - b) $x(n) = b^n u(-n-1)$
 - c) $x(n) = a^n u(n) + b^n u(-n-1)$
- 4) Find ROC & Z-transform of the sequence $x(n) = \left(\frac{1}{2}\right)^n u(n)$
- 5) State and Explain the properties of Z-transform.
- 6) Find the Z-transform of $x(n) = 2^n u(n-2)$
- 7) Find the Z-transform of $x(n) = n^2 u(n)$
- 8) Determine the convolution of two sequence as $x(n) = \{2, 1, 0, 1\}$ & $h(n) = \{1, 2, 3, 1\}$
- 9) Determine the Z-transform of the signal $x(n) = \left(\frac{1}{2}\right)^n u(n)$.
- 10) Determine the Z-transform of the following signals.
 - a) $x(n) = \begin{cases} \left(\frac{1}{2}\right)^n & n \geq 5 \\ 0 & n \leq 4 \end{cases}$
 - b) $x(n) = (1+n)u(n)$
 - c) $x(n) = (-1)^n 2^n u(n)$

- 11) find the inverse z -transform of the following function using long division method.

$$X(z) = \frac{1 + 4z^{-2}}{1 + z^{-2}}$$

- 12) Determine the inverse z -transform of

$$X(z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}} \text{ by using partial fraction Expansion.}$$

- 13) Determine the inverse z -transform of the following $X(z)$ by partial fraction expansion method

$$X(z) = \frac{z+2}{2z^2 - 7z + 3}$$

- 14) find the inverse z -transform of $X(z) = \frac{1}{(1+z^{-1})(1-z^{-1})^2}$ by using partial fraction expansion method.

- 15) State time Reversal property of z -transform.

- 16) What is the relation between z -transform and fourier transform.

- 17) Write down any 2 property of z -transform.

- 18) state scaling property of z -transform.

- 19) state and prove delay property of one sided z -transform.

- 20) Define final value theorem.




chapter-04, Fourier Transform

- 1- find N-point DFT of 2^n .
- 2- Define twiddle factor.
- 3- compare DFT & DTFT.
- 4- Determine the DFT of $y(n) = \{1, 2, 1, 1\}$
- 5- Define circular convolution.
- 6- state Parseval's theorem and prove it.
- 7- What is the relation between DFT & Z-transform
- 8- find the IDFT of $X(K) = \{3, 2+j, 1, 2-j\}$
- 9- Compute the N-point DFT of
 - a) $x(n) = \delta(n)$ b) $x(n) = \delta(n-n_0)$
 - c) $x(n) = a^n$ for $0 < a < 1$
- 10- find the 4-point DFT of the sequence
 $x(n) = \cos \frac{\pi n}{4}$
- 11- Determine the circular convolution of two sequences.
 $x_1(n) = \{1, 2, 2, 1\}$ and $x_2(n) = \{1, 2, 3\}$
- 12- Determine the circular convolution of the sequences
 $x_1(n) = \{1, 2, 3, 1\}$ and $x_2(n) = \{1, 3, 2, 2\}$

Chapter-05 FFT & Digital filters.

- 1) Define Radix of FFT algorithm.
- 2) Differentiate DIT & DIF radix-2 FFT.
- 3) An 8-point sequence is given by $x(n) = \{2, 1, 2, 1, 1, 2, 1, 2\}$ compute 8-point DFT of $x(n)$ by
 - a) radix-2 DIT-FFT
 - b) radix-2 DIF-FFT
- 4) Draw the basic butterfly or Flow graph of DIF-radix-2 FFT.
- 5) Explain FIR filters with its application.
- 6) Explain basic DSP architecture.


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Question Bank

Image & video processing

CH-1

Short question

- 1) Define pixel
- 2) Define sampling & quantization.
- 3) Define quantization error.
- 4) What is the function of sensors.
- 5) What is a digital image.

Long question

- 6) Discuss the fundamental steps in digital image processing system.
- 7) Explain the general purpose image processing system.
- 8) Discuss the basic elements of visual perception.
- 9) Explain any method of image sensing for generation of 2D images.
- 10) What is image sampling, quantization. Explain how a digital image, sample, quantize and coded.
- 11) With example state the neighbourhood and adjacency relationship of pixels.

CH-2

- 1) Define histogram.
- 2) What is the function of low pass filter in digital image.
- 3) Explain the method of binary gray level transform.
- 4) Discuss how 1st & 2nd order image sharpening works.
- 5) Explain histogram equalization methods.
- 6) What is Averaging in digital image.
- 7) Explain the basic methods of filtering.
- 8) What is the function of high pass filter.

CH-3

- 1) Explain working of different color fundamentals / color models
 - 1) RGB
 - 2) YUV
 - 3) HSI
- 2) Define color segmentation with its requirement.
- 3) Name different color transformation techniques used in digital image.
- 4) Define color slicing.

CH-4

1. Explain the method of edge linking and boundary detection technique.
2. Explain region based segmentation.
3. State the principle detection of discontinuities in digital image.
4. Define thresholding.
5. Name and explain methods of thresholding.

CH-5

1. What is uncertainty principle in Fourier transform.
2. What is continuous wavelet transform.
3. Define wavelet packet.
4. Explain the working of subband filter banks.
5. Explain the time frequency localization method.

Ch-6


1. Define JPEG & JPEG-2000.
2. Explain the working of Lossless compression methods.
3. Explain Discrete cosine transform.
4. Explain the lossy compression predictive coding system.
5. State the difference between JPEG & JPEG 2000 standards.

Ch-7

- 1) Explain the group of pictures with frame classification.
- 2) Define macro blocks and blocks.
- 3) Explain the elemental video encoder and decoder.
- 4) Write short notes on:
 - 1) MPEG
 - 2) H.26X standards
- 5) What is interframe redundancy?
- 6) Explain the motion estimation techniques.

CH-8

1. Define temporal segmentation.
2. State the difference between hard cuts and soft cuts.
3. State the procedure of video object detection and tracking.
4. What is spatial segmentation in motion based video.
5. How segmentation is important in video coding.


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Question Bank for Microcontroller and Embedded Systems

6th sem(Electronics and Telecommunications)

Chapter-1-introduction to embedded systems

Q-1

- (a) Write down the names of the technologies in the embedded system design? 2M
- (b) what are the design metric drawbacks of General purpose processors? 2M
- (c) what is an Application-specific Processor? 2M
- (d) what is an IC? 2M
- (e) what is PAL and PLA? 2M

Q-2

- (a)What are the characteristics of embedded systems? 5M
- (b) Explain a Digital camera? 5M
- (c) Explain Digital Signal Processing? 5M
- (d) Write down the applications of embedded system? 5M
- (e) Explain Single Purpose Processor technology? 5M

Q3

- (a) Explain IC technology? 7M
- (b) Explain PLD? 7M
- (c) Explain semi-custom ASIC? 7M
- (d) Explain microcontrollers? 7M
- (e) Explain general-Purpose Processors? 7M

Chapter-2-8051 Architecture

Q-1

- (a)Write down the pin number and function of RXD and TXD pins in 8051 microcontroller? 2M
- (b)What is the function of EA pin? 2M
- (c)Write down the function of pin number-9? 2M
- (d)Write down the function of WR and RD? 2M
- (e)If external memory is not present what is the function of Port-2? 2M

Q-2

- (a) What is the function of ALE pin? 5M
- (b) What is the function of EA pin? 5M
- (c) Explain Von-Neuman architecture? 5M
- (d) Explain Program memory? 5M
- (e)Explain special function register? 5M

Q-3

- (a)Explain port structure of 8051? 7M
- (b)Explain stack pointer register and input/output register? 7M
- (c) Explain Additional RAM? 7M
- (d) Explain RAM memory/Data memory? 7M
- (e) Explain Register A, Register B and Registers R0-R7? 7M

Chapter-3 8051 Addressing modes and instruction sets

Q-1

- (a) MOV A,#20h is an example of which addressing mode? 2M
- (b)Give an Example of Register Indirect Addressing mode? 2M
- (c) ADD A,#84 is an example of which instruction? 2M
- (d) Give example of Bit level and Byte level instruction? 2M
- (e)What are JC,JNC and SJMP? 2M

Q-2

- (a) Explain TCON register? 5M
- (b)Explain Immediate Addressing mode? 5M

- (c) Explain the operation of Timer in different modes? 5M
- (d) Explain Register Addressing Mode with example? 5M
- (e) Explain TMOD register? 7M
- (f) Explain Branch instruction and Logic instruction? 7M

Chapter-4-Microcontroller 8051 Assembly Language Programming Tools

Q-1

- (a) Write a program to add two values? 2M
- (b) Write a program to Shift and Swap a number? 2M
- (c) Write a program using logical instruction? 2M
- (d) Write a program for single bit instruction for square wave of 50% duty cycle? 2M

- (e) Write a program to toggle Port-0? 2M

Q-2

- (a) Write a program using Compare instruction? 5M
- (b) Write a program using Call instruction? 5M
- (c) Write an ASCII application program? 5M
- (d) Write a counter program? 7M
- (e) Write a program for timer-1? 7M
- (f) Write a program for BCD conversion? 7M

Chapter-5-Peripherals

Q1

- (a) What is the other name of Watchdog Timer? 2M
- (b) What is the function of TB8 and RB8 pins UART? 2M
- (c) Explain Sampling? 2M
- (d) What is the function of IRQ and SQW pins of DS12887 chip? 2M
- (e) What is the function of R/W pin of DS12887 chip? 2M

Q-2

- (a) Explain Real time clocks? 5M
- (b) Explain Analog to Digital converters? 5M
- (c) Explain how UART transmits and receives data? 5M
- (d) Explain Watchdog timer? 5M
- (e) Explain how Stepper motor is interfaced? 5M

Q-3

- (a) Explain Relay with a program? 7M
- (b) Write a program to interface DC motor with 8051? 7M
- (c) Explain SCON register? 7M
- (d) Explain LCD controller? 7M
- (e) Explain DS12887 chip with a neat pin diagram? 7M

Chapter-6-Programmable Logic Controllers

Q-1

- (a) What is a Programmable Logic controller? 2M
- (b) Write down the names of PLC programming language? 2M
- (c) When is an On-delay timer used? 2M
- (d) What is JMP, LBL, JSR instruction? 2M
- (e) Explain C 6: 4? 2M

Q-2

- (a) Explain Examine If Open (XIO) and Examine If Close (XIC) instruction? 5M
- (b) Explain the basic operation of a PLC? 5M
- (c) Explain Program Scan of a PLC? 5M
- (d) Write down the difference between PLC and PC? 5M

(e) Explain Data manipulation instruction? 5M

Q-3

(a) Explain control instruction of PLC? 7M

(b) Explain Up counter using PLC program? 7M

(c) Explain Timer programming? 7M

(d) Explain Ladder Rung diagram? 7M

(e) Write a Program for motor control circuitry for controlling two motors sequentially? 7M

- Q-1. what is RADAR? [2]
- Q-2. Explain the basic block diagram of a pulsed RADAR system? [5]
- Q-3. Draw the timing diagram of a pulsed radar system & explain [5].
- Q-4. what are the basic functions of a RADAR system? [5]
- Q-5. what are the different types of detection? Explain with suitable diagram [5]
- Q-6. Explain with examples, how the RADAR systems can be classified on the basis of operational frequency band? [7]
- Q-7. what are the classifications of RADAR system, based on the transmitted waveform and spectrum? [5]
- Q-8. Explain the classification of RADAR system on the basis of intended mission & mode? [5]
- Q-9. Derive the expression for maximum range of a RADAR system? [7]
- Q-10. what is performance factor of a RADAR? what are the factors that affect maximum range of a RADAR? [7]
- Q-11. Draw the block diagram of a pulsed RADAR system and explain each section? [7]
- Q-12. what is RADAR indication and what is moving target indicator? [7]

Q.13 State and explain Doppler's effect? [5]

Q.14 with a block diagram explain the operation of MTI Radar? [7]

Q.15 Draw the block diagram of CW Radar and explain? [5]

Q.16 Describe the advantages, disadvantages and applications of CW Radar [7]

Q.17

~~2017-2018~~ 2017-18 I.A. Advance communication Engg, 6th Sem, ESTC
f.m. = 20, Time, 1 hr. Answer all questions.

Q.1. Derive Radar Range equation? [5]

Q.2. Draw and explain the Block diagram of a CW doppler radar? [5]

Q.3. Define Kepler's third law? Derive the expressions for a) height of geosynchronous satellite b) orbital velocity c) Round trip time delay [5]

Q.4. What is satellite link systems? Explain all the link models. [5]

— x —

(25)

Time: 1hr, PM: 20, Answer all questions.

- Q.1 What is a RADAR? [2]
- Q.2 Draw the timing diagram of a pulsed RADAR system and explain? [3]
- Q.3 Derive the expression for maximum range of a RADAR? [5]
- Q.4 What are ~~inclined orbit~~, equatorial orbits, polar orbits and inclined orbits for a satellite? [2]
- Q.5 Define satellite elevating categories like LEO, MEO & GEO? [3]
- Q.6 State and explain Kepler's Harmonic law? Using it find height, orbital velocity and round trip time delay of a Geosynchronous satellite? [5]

- X -

- Q.1 Define satellite? what are natural & artificial satellites? [2]
- Q.2 Define orbit of a satellite? Define [2]
- Q.3 Define Apogee, perigee in orbit? [2]
- Q.4 Define equatorial orbit, polar orbit and inclined orbit of a satellite? [5]
- Q.5 Define LEO, MEO & GEO? [5]
- Q.6 Define geostationary satellites and discuss the requirements for a satellite to remain in geostationary orbit? [5]
- Q.7 Explain Kepler's 1st and 2nd laws? [5]
- Q.8 State and explain Kepler's 3rd law (harmonic law) [7]
- Q.9 Derive the expressions for a) height of geo-synchronous satellite b) geo-synchronous satellite orbital velocity c) Round trip time delay of a geo-synchronous satellite? [7]
- Q.10 What are the advantages and disadvantages of geo-synchronous satellites? [5]
- Q.11 What are the satellite frequency allocations and frequency bands? [5]
- Q.12 What is satellite link systems? Explain with block diagram, a) uplink b) downlink and c) cross link models? [7]
- Q.13 What is multiple access and what are the different multiple access? [5]
- Q.14 Explain time division multiple access? [5]
- Q.15 Explain code division multiple access with block diagram & CDMA encoder & decoder? [7]

Ch-3

Optical fiber communication

Q.1 what is optical fiber communication? [2]
②

Q.2. explain in detail the advantages and disadvantages of optical fiber cables [7] versus metallic cables.?

Q.3. with a neat diagram explain the complete electromagnetic spectrum? [5]
② ✓

Q.4 explain in detail the optical fiber construction? [5]

Q.5 what are the different cable configurations? [5]

Q.6 in reference to an optical fiber cable — write notes on — [5×4]
✓
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- velocity of propagation.
- critical angle.
- Angle of acceptance.
- Numerical aperture.

Q.7. explain with a neat diagram — the block diagram of an optical fiber communication system. [5]

Q.8 what are the different modes of propagation and index profile? [7]

Q.9. write notes on the following optical fiber configurations? [3×5]

- a) Single mode step index optical fiber
- b) Multimode step index optical fiber
- c) Multimode graded index optical fiber

Q.10 Define attenuation in optical fibers? [5]

Q.11 ✓ what are the different types of losses in optical fibers. [7]

Q.12 what is dispersion? what are the different types of dispersion in optical fibers? [5]

Q.13 Describe in detail, the construction and operation of an LED? [7]

Q.14 ✓ what is LASER? what are the different types of LASER? [5]

Q.15 Describe construction and operation of a LASER? [5]

Q.16 what is an optical detector?
what are the different types? [5]

Q.17 explain construction and operation of the following optical detectors? [2x5]
a) PIN diode b) Avalanche photo diode (APD)

Q.18 what are optical connectors? [5]

Q.19 what are optical splitters? [5]

Q.20 what is an optical coupler? [5]

Q.21 explain different applications of optical fibers? [5]

Q.22 explain the concept of wavelength division multiplexing (WDM)? [5]

← x →

Ch-4 Question Bank

Q.1 Describe functions of a basic Telephone set ? [5]

Q.2 What are the functions of switching system in a telephone ? [5]

Q.3 Stepwise describe the call procedure ? [5]

Q.4 What is space switching ? Explain in detail ?

Q.5 What is time switching ? [5]

Q.6 Explain the principle of PDH and SDH modes of transmission ? [7]

Q.7 What is ATM network transmission protocol ? [7]

Q.8 Write a brief note on ISDN ? [5]

Q.9 What are the national and international numbering plan of Telephone networks ? [7]

Q.10 Explain the operation of PBX ? [5]

Q.11 Explain digital EPABX ? [5]

Q.12 What are the different power measuring units ? [5]