DADI INSTITUTE OF ENGINEERING & TECHNOLOGY

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Academic Year : 2017-2018
Name of the Faculty : A.N.S.ANUSHA
Designation : Asst.Professor
Department : ECE
Year/Semester : III –II Semester A&B
Subject : BIO-MEDICAL ENGINEERING

Unit-1

1. a) What is a man instrument system along
   b) Components involved in the man instrument system.
2. Discuss about the various Physiological systems of the body
3. Discuss the various problems encountered in living system
4. a) What are the Sources of Bioelectric Potentials?
   b) Explain the resting and action potentials of a cell.
5. Explain the bioelectric Potentials-
   a) ECG
   b) EEG
   c) EMG.

Unit-2

1. a) Explain the Electrode theory
   b) Explain the different active and passive transducers
2. a) Explain various 4types of Biochemical transducers
   b) What are the Applications of Biochemical Transducers?
3. Explain different types of Bioelectric Electrodes
4. Explain about the basic transducer principles.
5. a) Explain the Transducers for Biomedical Applications.
   b) Explain the Pulse and Respiration Sensor

Unit-3

1. Explain the analogy of Heart along with the cardiovascular system.
2. a) Explain t he Electrocardiography
   b) Explain the blood Pressure measurement
3. a) Explain the measurement of blood flow
   b) Explain Plethysmography

4. a) Explain the Physiology of the respiratory System
   b) Describe the lung volume Capacities
5. Describe the various Respiratory therapeutic Equipment

Unit-4

1. Explain the Elements of Intensive Care Monitoring
2. Describe the Diagnosis ,Calibration and reparability of patient care monitoring
3. a) What is a Defibrillator
   b) Describe the use and different defibrillators
4. a)Describe the different pacing modes of a pacemaker
   b) Describe the laparoscope technique
5. What is Diathermy? Explain the Different types of Diathermy

Unit-5

1. a) What are the principles of Ult4rasonic measurement?
   b) What are 4the ultrasonic applications of therapeutic uses?
2. a) discuss about the various implantable units
   b) Explain how telemetry can be used for measurement of ECG during excursive.
3. a) Discuss about MRI
   b) Mention the applications of MRI
4. a) Describe the CAT scan
   b) Write the applications of CAT scan.
5. Explain the Principle involved in the X-ray System

Unit-6

1. a) Explain about the various physiological effects.
   b) Give examples of the physiological effects of electric current
2. a) what are Biopotential amplifiers? Explain
   b) What are the applications of biopotential amplifiers?
3. a) what ar4e the various Shock Hazards from Electrical Equipment
   b) Give a brief note on methods of accident Prevention
4. Explain the Isolated Power distribution system
5. a) Explain the monitors involved in the Biopotentials measurement
   b) Explain the monitors involved in the Biopotentials measurement

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Question Bank(2017-2018)

Name of the Faculty :K.Jogi Naidu
Subject : Digital Communications

Regulation:R13

III Year – II SEMESTER

UNIT I :PULSE DIGITAL MODULATION

1 a)Explain delta modulation in detail with suitable diagram. [10M]

b) Given a sine wave of frequency fm and amplitude Am applied to a delta modulator having step size _. Find the condition on Am for which slope overload distortion will occur

2 a) Draw the block diagram of ADM system? Explain each block.

b) What are the noises in PCM? Derive an expression for quantization in noise in PCM.

3 a) Explain quantization error and derive an expression for maximum SNR in PCM system that uses Linear quantization.

b) In a binary PCM system, the output signal to quantizing noise ratio is to be held to a minimum value of 40dB. Determine the number of levels and find the corresponding signal to quantizing noise ratio.

4 a) A Television signal having a bandwidth of 10.2 MHz is transmitted using binary PCM system. Given that number of quantization levels is 512.Determine:

(i)Code Word length (ii) Transmission Bandwidth (iii) Final bit rate (iv) Output signal to quantization noise ratio

b) What is slope overload and granular noise distortions are removed in ADM? Explain

5 a) What is the necessity of non-uniform quantization and explain companding. [10M]

b) If mp = 20V and 256 quantizing levels are employed, what is the voltage between levels when there is no compression? For μ = 255, what is the smallest and what is the largest effective separation between levels?

6 a) Discuss in detail the noise effects in delta modulation

b) Briefly list out the differences between PCM and DM.

UNIT II:DIGITAL MODULATION TECHNIQUES

1 (a) Draw the block diagram of DPSK modulator and explain how synchronization problem is avoided for its detection.

b) Write the power spectral density of BPSK and QPSK signals and draw the power spectrum of each.

2. (a)Explain the generation of M-ary ASK with a neat block

b) Explain the principle of QPSK system. Compare binary PSK and QPSK schemes.

3 (a) Explain with neat block diagram the generation and recovery of BPSK

b) What are power spectra? Explain power spectra of BPSK and BFSK signals along with graphs.

4. Determine the bandwidth required for M-ary FSK system. Draw the geometrical representation of M-ary FSK signals and find out the distance between the sign

b) Sketch the QPSK waveform for the sequence 1101010010, assuming the carrier frequency equal to bit rate.

5. (a)Discuss the ASK system in detail

b) Draw the block diagram of the DPSK modulator. Explain how the synchronization problem is avoided in this.

UNIT III: DATA TRANSMISSION

1.a) Explain about ASK system and derive the relation for error probability of binary ASK.

b) A binary receiver system receives a bit rate of 1Mbps. The waveform amplitude is 5mV and the noise power spectral density is 0.5x10-11 W/Hz.

Calculate the average bit error probability if the modulation schemes are ASK, FSK and PSK.

2. a) Draw and explain the coherent system of signal reception. [10M]

b) Binary data is transmitted over a telephone line with usable bandwidth of 2400 Hz using the FSK signaling scheme. The transmit frequencies are 2025 and 2225 Hz, and the data rate is 300 bits/Sec. The average signal to noise power ratio at the output of the channel is 6dB. Calculate Pe for the coherent and non coherent demodulation schemes..

3.a) Explain about coherent binary PSK transmitter and receiver. Assuming channel noise to be additive white Gaussian obtain expression for probability of error.

b) Calculate the transfer function of the Optimum filter.

4.(a)What is correlator

(b) Explain the optimum filter reception using correlator.

5(a)What is a matched filter? How it differs from a optimum filter.

(b)Derive an expression for impulse response of the matched filter.

6.Explain how integrator is used to detect the baseband signal. Obtain an expression for S/N of integrator and dump receiver.

UNIT IV: INFORMATION THEORY

1. a). Define entropy.

   b). A source x generates four messages mo,m1, m2, m4 with probabilities 1/3, 1/6, 1/4, ¼ respectively. The successive messages emitted by the source are statistically independent. Calculate entropy of the source X.

2. a) Define and explain the following. i) Information ii) Efficiency of coding iii) Redundancy of coding.
   b) Prove that H(X,Y) = H(X) + H(Y/X) = H(Y) + H(X/Y).

3. a) State and prove the condition for entropy to be maximum.
   b) Prove that $H(Y/X) \leq H(Y)$ with equality if and only if X and Y are independent.

4.(a) What is mutual information? State and prove the properties of it.
(b) If I(x1) is the information carried by symbol x1 and I(x2) id the information carried by symbol x2 then prove that the amount of information carried compositely due to x1and x2 is I(x1, x2)= I(x1) I(x2)

5 An analog signal band limited to 10HKz quantize is 8-lavels of PCM System with probability of 1/4,1/5,1/4,1/10,1/20,1/10,1/20 and 1/10 respectively. Find the entropy and rate of information.

6 a) Explain the concept of amount of information. [8M]
b) An analog signal is band limited to B Hz, sampled at the nyquist rate, and the samples are quantized into 4 levels. The quantization levels Q1, Q2, Q3 and Q4 (messages) are assumed independent and occur with probabilities p1= p4=1/8 and p2= p3=3/8. Find the information rate of the source.

UNIT V :SOURCE CODING

1 Explain the Huffman coding technique with example.

2 a) Explain procedure of Shannon-fano coding and Huffman coding. b) A discrete memory less source X has 5 symbols x1, x2 x3, x4 & x5 with P(x1)=0.4, P(x2)=0.19, P(x3)=0.16, P(x4)=0.15 & p(x5)=0.1. (i) Construct a Shannon-fano code for X, and calculate the efficiency of the code. (ii) Repeat for the Huffman code and compare the results.

3 (a)Discuss the channel capacity for discrete and analog channels.

(b)Apply Shannon Fano coding for the 5 messages with probabilities 0.4, 0.15, 0.15, 0.15, 0.15 and find the coding efficiency.

4.What is binary symmetric channel and derive expression for its capacity.

5.A discrete memory less source has an alphabet of seven symbols with probability for its output, as described here:

Symbol	prob.
S_0	0.25

S_1	0.25
S_2	0.125
S_3	0.125
S_4	0.125
S_5	0.0625
S_6	0.0625

(i) Compute the Huffman code for this source and explain why the compute source code has an efficiency of 100 percent. (ii) Calculate H

UNIT VI :LINEAR BLOCK CODES&CONVOLUTION CODES

1.Define the linear block codes and explain matrix description of a linear block codes.
(b) The generator matrix for a (6, 3) block code is given below. Find all code vectors of this code. G= [I : P]; where P= [0 1 1; 1 0 1; 1 1 0], & I = Identity Matrix.

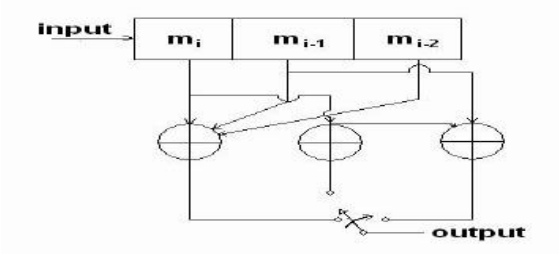
2.a) Explain the advantages and disadvantages of cyclic codes.

b) Construct the (7, 4) linear code word for the generator polynomial G(D) = 1+D2+D3 for the message bits 1001 and find the checksum for the same.

3.a) Explain the principle and operation of encoder for Hamming code.
b) An error control code has the following parity check matrix. *H* = [1 0 1 1 0 0; 1 1 0 0 1 0; 0 1 1 0 0 1] i) Determine the generator matrix 'G' ii) Decode the received code word 110110. Comment on error detection capability of this code.

4.A) State and explain the properties of cyclic codes.
b) The generator polynomial of a (7, 4) cyclic code is x3+x+1. Construct the generator matrix for a systematic cyclic code and find the code word for the message (1101) using the generated matrix.

5.a) Briefly describe the Viterbi algorithm for maximum-likelihood decoding of convolutional codes.
b) For the convolutional encoder shown in figure 1, draw the state diagram and the trellis diagram.



6 (a) What are code tree, trellis and state diagrams for a convolutional encoder?

(b) Draw the trellis diagram of a Convolutional code of code rate r=1/2 and Constraint length of K=3 starting from the state table and state diagram for an encoder which is commonly used.

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Department of Electronics & Communication Engineering

Question Bank for III B.Tech Sem-II ECE (2017-18)

Name of the Faculty: K.Suma
Subject: Digital Signal Processing

Regulation: R13

Year and Semester: III Year – II SEMESTER

Unit-1

1(a)Determine the zero-input response and impulse response h[n] of the system described by the second-order difference equation:

$y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$

(b) Derive the relationship between impulse response and frequency response of a discrete time system.

2 (a) Explain causality and stability of a linear time invariant system.

(b) Determine the frequency response, magnitude and phase responses and time delay of the systems given by

y(n)-0.5y(n-1)=x(n)

3(a) Determine the frequency response, magnitude and phase responses and time delay of the systems given by

y(n)=x(n)-x(n-1)+x(n+2)

(b) State and explain the transfer function of an LTI system.

4 (a)Determine frequency, magnitude and phase responses and time delay for the system.

y(n)+0.25y(n-1)=x(n)-x(n-1)

(b) Define the terms : linearity, time invariance and causality for a discrete time system.

5(a) Define various elementary discrete time signals. Write notes on them and explain about their properties.

(b) Determine whether the following systems are time invariant or not

a)y[n]=x[n]+nx[n-3] b)y[n]=sin(x[n]).

Unit-2

1(a) Compute the FFT for the sequence x(n) = n+1 where N =8 using DIT algorithm

(b) State and prove the periodicity property in DFT.

2(a) Find the N-point DFT for x(n) = an for 0 < a < 1? [

(b) Given x(n) = {1,2,3,4,4,3,2,1}, find X(k) using DIF FFT algorithm.Define DFT of a sequence x(n). Obtain the relationship between DFT and DTFT.

3(a) Find the DFT of the following sequence using FFT DIF?
X(n) = {1,2,3,5,5,3,2,1}
(b) Compute the DFTs of the sequence x(n) = 2^{-n}, where N = 8 using DIT
4(a) Compute the DFT of the sequence x(n) = sin[nπ/4], where N=8 using DIT FFT algorithm
b) Determine the IDFT of the sequence
X(K)=(6,-√2j4.8284,-2+j2, ,√2-j4.8284,-2, ,√2+j4.8284,-2-j2, ,-√2-j4.8284)
5 Explain the inverse FFT algorithm to compute inverse DFT of N=8 Sequence. Draw the Flow Graph.

Unit-3

1. Obtain the cascade and parallel realisation structures for the following signals.

2. Determine the impulse response of the system described by the difference equation

   $y[n] = 0.6\, y[n-1] - 0.08\, y[n-2] + x[n]$ using Z transform.

3. Obtain the Direct Form I and Direct Form II realization for the system described by

$$H(z) = \frac{1 + 2z^{-1} + z^{-2}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}}$$

4. Explain the different structures for realization of IIR system and explain how conversion can be made from direct form I structure to direct form II structure.

5. a) Compare lattice structures with direct form structures.

   b) Draw the lattice form implementation for FIR filter having transfer function

$$H(z) = (1 + 2z^{-1})(3 + 4z^{-1})(5 + 6z^{-1})$$

6. Test for the stability of the following system:

$$y[n] = \frac{3}{8}y[n-1] - \frac{1}{8}y[n-2] + x[n] + \frac{1}{3}x[n-1]$$

   Is it an IIR system or an FIR system? Explain the reason. Also realize the system using cascade structure.

$$H(z) = \frac{\left(1 + \frac{1}{2}z^{-1}\right)}{\left(1 - z^{-1} + \frac{1}{4}z^{-2}\right)\left(1 - z^{-1} + \frac{1}{2}z^{-2}\right)}$$

Unit-4

1. Design a digital low pass filter with pass band cut off frequency ω_p=0.375π with δ_p=0.01 and stop band frequency ω_s=0.5π with δ_s=0.01.The filter is to be designed with bilinear transformation method.
2. Design a high pass filter using hamming window with a cut-off frequency of 1.2 rad/sec and N=9.
3. Find filter order for following specifications:

$$\sqrt{0.5} \leq \left|H\left(e^{j\omega}\right)\right| \leq 1 \; for \; 0 \leq \omega \leq \frac{\pi}{2}$$

$$\left|H\left(e^{j\omega}\right)\right| \leq 0.2 \; for \; \frac{3\pi}{4} \leq \omega \leq \pi$$

   With T = 1 sec. Use Impulse Invariant method.
4. Design a FIR low pass filter with a cut-off frequency of 1 kHz and sampling rate of 4 kHz with eleven samples using Fourier series method.
5. Determine the order and transfer function of the Chebyshev filter for following specifications:
   i. Maximum pass band ripple is 1dB for $\Omega \leq 4$ radians/sec.
   ii. Stop band attenuation is 40 dB for $\Omega \geq 4$ radians/sec.
6. Design a low pass digital FIR filter using Kaiser Window satisfying the specifications given below.
   Pass band cut-off frequency = 150 Hz.
   Stop band cut-off frequency = 250 Hz.
   Pass band ripple = 0.1dB
   Stop band attenuation = 40 dB
   Sampling frequency = 1000 Hz

Unit-5

1(a) Derive an expression for the spectrum of output signal of an decimator.

(b) What are the applications of multirate system?

2. (a) Discuss the applications of Multirate Digital Signal Processing.

b) Draw the block diagram of a multistage interpolator and explain it

3. (a) Draw the block diagram of a multistage decimator and explain it

(b) Discuss the computationally efficient implementation of decimator in an FIR filter.

4.(a) How can sampling rate be converted by a rational factor M/L? [8M]

(b) Draw and explain the polyphase structure of a interpolator.

5. For a given discrete sequence $x[n] = \{1, 2,3, 4,5,6,7,8,9\}$, determine and sketch the up sampling sequence $y[n] = x[2n]$.

Unit-6

1(a) Explain the purpose of six registers used in the TMS320C2X processor

(b) What are the limitations of pipelining in Digital Signal Processor?

2. (a) Draw and explain the major block diagram of the TMS320C3X.

(b) Explain the function of Barrel Shifter in the digital signal processor..

3. (a) Draw and explain the memory architecture of the TMS320C3X processor.

(b) What are the major advantages of having on-chip memory?

4. (a) What is MAC? Explain its operation in detail.

(b) What are the various addressing modes used in the TMS320C5X processor?

5. a) Draw and explain the bus architecture of DSP processors.

b) Briefly explain the special addressing modes available in DSP processors.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
MICROPROCESSORS AND MICROCONTROLLERS

III /II ECE – A&B : (Question Bank) : R-13 **2017-2018**

Name of the Faculty: Mr. B.N. Srinivasa Rao

UNIT-1

1. a) Differentiate between Microprocessor and Microcontroller. Mention few applications.[4]
   b) With the help of functional diagram explain the operation of 8086 microprocessor [6]

2 a) Explain any three string manipulation instructions of 8086. [5]
   b) Describe the function of the following pins in8086 maximum mode of operation
   i) TEST ii) RQ0 /$\overline{GT}_0$and RQ1//$\overline{GT1}_1$ [5]

3. a) Discuss briefly about the addressing modes of 8086 with examples. [5]
   b) Explain the minimum mode operation of 8086 with the help of a PIN diagram. [5]

4. a) Describe about the physical memory organization in an 8086 system (or) Discuss about the memory segmentation in 8086 processor. [5]
   b) Draw the timing diagram for the memory read cycle operation in the minimum mode of 8086 processor. [5]

5. a) Draw the Register organization of 8086 microprocessor and explain its operation. [5]
   b) What is BIU and give the special processor activities of 8086? [5]

UNIT-II

1. a) Draw the stack structure of 8086 Microprocessor and explain its need while presenting an Interrupt. [5]
   b) Write an assemble language program for finding the Largest number in an Array, the length of array is ten 16-bit numbers. [5]

2. a) Define Interrupt and explain the interrupt services routines in 8086 Microprocessor. [5]
   b) Write an assemble language program to find the sum of the squares of first ten numbers. [5]

3. a) List out the different mask able and non-mask able interrupt of 8086 Microprocessor and explain its importance. . [5]
   b) Write an assemble language program to arrange the given array in ascending order, the length of array is ten 16-bit numbers. . [5]

4. a) Draw the timing diagram for op-code fetch machine cycle and memory read

machine cycle.. [5]

b) Write a program with a flowchart to multiply two 8-bit numbers..

5. a) Write an ALP to find the multiplication of two 16-bit Hex numbers? [5]
   b) Write a recursive procedure to calculate the factorial of number N, where N is a two-digit Hex number. [5]

UNIT-III

1. a) Draw block diagram of 8255 and explain its modes of operation. [5]
   b) Show the control word format of 8255 and explain how each bit is programmed. [5]

2. a) Draw and Explain the cascaded mode operation of 8259 with a neat block diagram. [5]
   b) Discuss about the operational command words of 8259 and draw its frame format. [5]

3. With a neat diagram, explain the working of 8257 DMA controller. [5]

4. a) Draw the architectural block diagram of 8251A and write its signal descriptions. [5]
   b) Explain asynchronous mode of operation of 8251A. [5]

5. a) What are the registers available in 8257? What are their functions. [5]
   b) Discuss about the initialization command words of 8259 and their sequence in detail. [5]

UNIT-IV

1. a) Draw the flag register of 80386 processor and Explain the register organization of this processor. [5]
   b) Briefly explain the salient futures in an 80386 processor and compare them with an 80286 processor. [5]

2. a) Discuss the features of 80486 microprocessor. [5]
   b) Explain the different instruction set of an 80386 processor along with examples. [5]

3. a) Define paging. Draw and explain the paging mechanism of 80386 processor. [5]
   b) Draw the pin diagram of an80386 processor and explain the function of each pin in detail. [5]

4. a) Explain the salient features of 80286 processor. [5]
   b) Compare the real mode and protected mode of operations. [5]

5. a) Explain the memory management unit and special function register of 80386 processor [5]
   b) Explain the advantages of RISC over CISC processor. [5]

UNIT-V

1. a) Discuss about the addressing modes of 8051 micro controller [5]
   b) Explain the arithmetic and logic instruction of 8051 microcontroller with example. [5]

2. a) Explain the internal RAM organization of 8051. [5]
   b) What is the use of SFR? Discuss the structure of the following registers and explain. [5]
      a) PSW
      b) IE
      c) SCON
      d) TMOD
      e) PCON
      f) IP.

3. a) Explain the architecture of 8051 with its diagram. [5]
   b) Explain the data types and assembler directives of 8051. [5]

4. a) Explain the organization of memory in 8051 microcontroller
   b) Explain the structure of Program Status Word register of 8051. [5]

5. a) Explain the modes of operation of Timer unit in 8051 Microcontroller. [5]
   b) Write a program based on 8051 instruction set to pack array of unpacked BCD digits. [5]

UNIT-VI

1. Write short notes on following
   a) List out the salient futures of PIC 16C61 controller. [5]
   b) List out the salient features of PIC 16F8XX Flash controller. [5]

2. a) Explain the different Thumb programming model of ARM controller with examples. [5]
   b) Draw and Explain different timers presented in PIC controller. [5]

3. a) Draw the internal architecture of PIC 16C61 controller and explain its operation. [5]
   b) Draw the flag register of PIC 16C71 controller and explain the function of each flag in detail. [5]
4. a) Draw the format of program status register of ARM controller and explain the function of each bit in detail. [5]
   b) Explain the different ARM Instruction set of ARM processor and explain each instruction with example [5]
5. a) Explain different I/O ports presented in PIC controller and draw the necessary diagram for it.[5]
   b) Explain the feature of ARM controller in detail. [5]

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DPARTMENT OF ECE

III.B.TECH –II SEM

MICROWAVE ENGINEERING (QUESTION BANK)

Unit-1

1. a) Show that TM_{01} and TM_{10} modes does not exist in a rectangular waveguide.
   b) A rectangular wave guide with dimension of 8X4 cm operates in the TM11 mode at 10Ghz.Determine the characteristic wave impedance.

2) a) Derive the characteristic wave impedance of TE_{mn} modes in a rectangular wave guide and obtain the relation b/w the guided wave length and characteristic impedance.
   b) An air filled rectangular wave guide of inside dimensions 3X2 cm operates in the dominant TE_{10} mode (i) find cutoff frequency fc (ii) phase velocity of wave at a frequency of 3.5Ghz (iii) guided wave length at the same frequency.

3) a) Describe the method of designating the modes of transmission in rectangular wave guides. What is dominant mode and why it is most often used in wave guides.
   b) Define group velocity and phase velocity of a rectangular wave guide

4) a) Derive the expression for cutoff frequency, phase constant phase velocity, group velocity and wave impedance in rectangular wave guide. [8+8]
   b) Derive the expression =
   Where _g guide wave length and _c is cutoff length for rectangular wave guides

5) a) Derive the TE_{mn} mode field equations in a rectangular waveguide..
   b) Show that TM_{01} and TM_{10} modes do not exist in a rectangular waveguide

6) a) An air-filled rectangular wave guide has dimensions of a = 6 cm and b = 4 cm. The signal frequency is 3 GHz. Compute cutoff frequency, Guide wavelength, Phase constant and group velocity for the following modes
   i) TE_{10} ii) TE_{01} iii) TE_{11} iv) TM_{11}

   b) Obtain the expressions for average power transmitted through a rectangular wave guide for TE_{mn} and TM_{mn} modes.

7) a) The dominant mode TE_{10} is propagated in a rectangular waveguide of dimensions a=6 cm and b= 4 cm. The distance between a maximum and a minimum is 4.47cm. Determine the signal frequency of the dominant mode.
   b) What are dominant and degenerate modes? What is the significance of dominant modes? Indicate the dominant mode in rectangular wave guide and calculate f_c for the same.

8) a) An air filled rectangular waveguide shown in figure below transports energy in TE_{10} mode at the rate of 0.5 hp. Calculate the peak value of the electric field in the guide at 30 GHz.
b) Derive the TM_{mn} mode field equations in a rectangular waveguide. (6+10)

Unit-2

1 a)What is a cavity resonator? Discuss the applications of cavity resonator
b) Derive the expression for resonator frequency of rectangular cavity resonator

2 a) Derive the expression for resonant frequency of a rectangular cavity resonator.
b) An air filled circular waveguide has a radius of 2 cm and is to carry energy at a frequency of 10GHz. Find all the TE and TM modes for which energy transmission is possible

3 a) Explain why TEM mode does not exist in a circular wave guide.
b) What is the significance of Q in resonant circuits? Derive a general expression Q for a series resonant circuit what happens to Q when circuit is loaded.

4 (a) Discuss the advantages and disadvantages of microstrip lines.
(b) A circular waveguide operating in the dominant mode at a frequency of 9 GHz with a maximum field strength of 300 V/cm. The internal diameter is 5cm. Calculate the maximum Power.

5 (a) What are cavity resonators? Derive the equations for resonant frequencies for a rectangular and circular cavity resonators.
b) Calculate the resonant frequency of a circular resonator of following dimensions. Diameter = 12.5cm and length = 5cm for TM_{012} mode (consider P_{mn}=2.405 for dominant mode.
(c) What do you understand by the quality factor of a cavity resonator? Discuss the term unloaded Q and loaded Q.

6) (a) Derive the field expressions for a rectangular cavity resonator. Plot the field patterns forthe dominant mode of propagation in such a resonator for TE and TM moldes.

(b) Calculate the lowest resonant frequency of a rectangular cavity resonator of dimensionsa=2cm , b=1cm, d=3cm?(c) Mention one way of coupling energy to a resonator.

7) a) An air-filled circular waveguide has a diameter of 4 cm and is to carry energy at a frequency of 10 GHz. Determine all TE_{np} modes for which transmission is possible.
b) Define Q factor of a cavity resonator. Derive the expression for Q factor of a cavity resonator

8 a) A TE_{11} wave is propagating in a air-filled circular waveguide of diameter 10 cm at 3 GHz, find the cutoff frequency, guide wavelength, wave impedance in the guide.

b) With a neat diagram explain the working of a rectangular cavity resonator. Use relevant expressions for fields and obtain the expression for resonant frequency of oscillation.

9 a) A circular wave guide has a cutoff frequency of 9GHz in dominant mode. Find the inside diameter of the guide if it is i) air-filled. ii) Filled with dielectric with $_r$=4.
b) With a neat diagram explain the working of a cylindrical cavity resonator. Use relevant expressions for fields and obtain the expression for resonant frequency of oscillation.

Unit-3

1) a) Explain the working principle of directional coupler and derive the expression for Directivity and coupling coefficient. [8+8]
b) Write short notes on circulator.

2 a) Explain the principle of working of rectangular wave guide dielectric phase shifter.
b) Write short notes on H plane Tee

3) a) What is an Isolator? What is significance of it and its applications in microwave circuits? [8+8]
b) What is necessity of S matrix representation of microwave components

4) Write short notes on the following :
a) Directional coupler b) Magic Tee

5 a) Write short notes on wave guide discontinuities. [8+8]
b) Derive the S matrix of 3 port circulators.

6) Write short notes on: [8+8]
a) Wave guide phase shifter b) Flap attenuator

7) a) What is a directional coupler? Derive the S matrix of a 4-port directional coupler.
b) Derive the S matrix of a magic Tee

8) (a) What is the effect of discontinuity in a waveguide? Discuss in detail
(b) How many types of waveguide phase shifters do you know? Discuss one type in detail.
(c) Write a short note on resonant Iris.

9) (a) Explain the action of isolator, gyrator and circulator using ferrites. Mention their Typical applications.

(b) What are ferrites? Why are these useful in microwaves? Mention their properties.
(c) Define Faraday rotation.

10) (a) Briefly explain the following:
(i) Posts (ii) Turning screws (iii) Waveguide attenuators (iv) Waveguide joints
(b) Determine the [S] of a three port circulator for a given insertion loss of 0.5dB, isolation of 20dB and VSWR of 2

11) (a) Derive the scattering matrix for isolator, gyrator and circulator. Mention their typical applications too.
(b) In an H-plane Tee junction, 20mW power is applied to port 3 that is perfectly matched to the junction. Calculate the power delivered to the load 60_ and 75_ connected to ports 1 and 2.

12) (a) Explain the action of Rat-Race junction
(b) Discuss in detail about single hole and double hole directional coupler.
(c) Write a short note on coupling mechanisms.

13. (a) Derive the S matrix for directional coupler.
(b) Show that the sum of the terms of any column of the S matrix of a lossless network when multiplied by the complex conjugate of the corresponding terms of any other column is zero.

14) a) Explain probe and loop coupling mechanisms with neat sketches.
b) A 90 W power source is connected to the input of a directional coupler with C=25 dB, D=35 dB and insertion loss =0.5 dB. Find the output powers at the through, coupled and isolated ports.

15) a) Obtain the scattering matrix of a directional coupler.
b) What is Faraday rotation? Explain the principle operation of a Gyrator using relevant diagrams

16) a) Explain types of aperture coupling with neat sketches.
b) Explain the working of a dielectric phase shifters with neat sketch

17) Obtain the scattering matrix of a 3-port circulator .Given insertion loss of 0.5 dB, isolation of 20 dB and VSWR of 2.
b) Explain the principle of a hybrid ring

Unit-4

1) a) Explain the working of Reflex klystron with neat Applegate diagram. [8+8]

b) Derive the expression for the efficiency of a 2cavity klystron amplifier

2) a) What is velocity modulation? Explain how amplification takes place in two cavityklystron amplifier. [10+6]b) What is transit time? What is its significance in microwave tubes?

3 a) Derive the expression for output power and efficiency of a 2 cavity klystron. [8+8]
b) Explain the operation of reflex klystron oscillator with a neat diagram.

4 a) Draw the mode curves of Reflex klystron and derive the relation between mode number and repeller in Reflex klystron. [8+8]
b) Describe the non degenerate negative resistance parametric amplifier

5 (a) What is velocity modulation? How is it different from normal modulation? Explain how velocity modulation is utilized in klystron amplifier.
(b) A two cavity klystron is operated at 10GHz with V_0 =1200V, I_0=30mA, d=1mm, L=4cm and R_{sh}=40K _. Neglecting beam loading, calculate
(i) Input RF voltage V_1 for a maximum output voltage
(ii) Voltage gain and
(iii) Efficiency

6 (a) Draw a schematic diagram of a two-cavity klystron amplifier. With the help of an Applegate diagram, explain how an amplification is achieved?
(b) A two-cavity klystron amplifier has the following parameters:
Beam voltage V_0 = 900V
Beam current I_0=30mA
Frequency f =8GHz
Gap spacing in either cavity d = 1mm
Spacing between centers of cavities L = 4cm
Effective shunt impedance R_{sh}=40K_
Determine:
(i) The electron velocity
(ii) The dc electron transit time
(iii) The input voltage for a maximum output voltage
(iv) The voltage gain in decibels

7 (a) List and discuss the applications and limitations of Reflex klystron and Two-cavity klystron.
(b) A Reflex klystron oscillator has V_0=2500V, L = 6mm and f=3GHz. Calculate the repeller voltage for which the tube can oscillate in 1 ¾ mode and 3 ¾ mode
(c) Write a short notes on Reentrant cavities.

8 (a) Name the different methods of generating microwave power. Describe with necessary theory about the working of a reflex klystron oscillator. Explain how frequency stabilization is achieved in this tube?
(b) Briefly explain the limitations and losses of conventional tubes at microwave frequencies

Unit-5

1 a) Explain how amplification takes place in Helix TWT? [8+8]
b) What is Hartee condition in Magnetron?

2. a) What is magnetron? Explain the principle of operation of it with a neat sketch.
b) What is a slow wave structure? What are its applications? [10+6]

3 a) With a neat sketch explain the structure and principle of operation of TWT amplifier.
b) How is bunching achieved in a cavity magnetron? Explain. [8+8]

4. a) Explain the significance of slow wave structure in the amplification process. List out the major differences b/w TWT and klystron. [8+8]
b) Explain the operation of 8 cavity magnetron

5 (a) Mention how a TWT can be converted to an oscillator? Explain the operation of such a device. How is large tuning range possible with such a device?
(b) A Helical TWT has a diameter of 2mm with 50 turns per cm.
Calculate the axial phase velocity and the anode voltage at which the TWT can be operated for useful gain.

6. (a) What are the different slow wave structures? Explain how a helical TWT achieves amplification?
(b) Discuss the necessity of strapping in magnetrons?

7 (a) Write a brief note on the following:
(i) _ mode operation of magnetron (ii) slow wave structures
(b) Discuss the performance of magnetrons and list the important applications.

Unit-6

1) a) Explain the principle of operation and characteristics of GUNN diode. [8+8]
b) Explain the operation of IMPATT diode with neat diagram.

2. a) Explain the procedure for measuring VSWR<10 [8+8]
b) Explain the procedure for measuring attenuation with neat diagram.

3. a) What are the bulk properties of GUNN diode that give rise to negative resistance?
b) Draw the equivalent circuit of parametric amplifier and explain the parametric

involved. [8+8]

4. a) Write short notes on microwave frequency measurements. [8+8]
b) Draw a neat sketch of a MW test bench for impedance measurements.

5. a) Describe a non degenerative resistance parametric amplifier. [8+8]
b) What is TRAPATT diode? How it is better than IMPATT diode.

6. a) Explain the procedure for measuring VSWR>10 using microwave test bench. [8+8]
b) Write short notes on reflection coefficient and insertio

.

7. a) Explain the physical structure and construction of IMPATT diodes. [8+8]
b) Compare IMPATT and TRAPPAT diodes.

8. a) Give the measurement procedure for measuring Q factor of resonant cavity. [8+8]
b) Define VSWR. Describe the methods for measuring

9) what is avanche Transit time devices? Explain the operation, construction and applications of the following devices:
(i) IMPATT
(ii) TRAPATT
(b) Explain the Gunn effect using the two valley theory.

10) (a) Draw the block diagram of a microwave setup for measurement of high microwave powers and explain the procedure.
(b) Explain any two methods of measuring microwave frequency.Discuss the several donation formation modes of a Gunn diode.

11. (a) Give the block diagram for the measurement of impedance at microwave frequencies and explain the procedure.

(b) Explain the principle of power measurement using Bolometric method

12) (a) An IMPATT diode has a C_j of 0.05pF and L_p of 0.5nH, C_p is negligible. If the breakdown voltage is 100V and the bias current is 100mA. Determine the resonant frequency and efficiency. Assume the RF peak current as 0.8A and R_L as 2_.
(b) Discuss in brief about RWH theory.
(c) Discuss the merits and demerits of IMPATT diode.

13. (a) Briefly explain about the measurement of low and high VSWR.
(b) How are microwave measurements different from low frequency measurements?

14. (a) Explain the LSA mode of operation in a Gunn diode.
(b) Discuss the differences between transferred electron devices and avalanche transit time devices.
(c) What are Gunn domains?

15. (a) Give the block diagram for the measurement of attenuation at microwave frequenciesand explain the procedure.
(b) Calculate the SWR of a transmission system operating at 8GHz. The distance between two minimum power points is 0.9mm on a slotted line whose velocity factor is unity.
(c) Briefly explain the different blocks in microwave bench setup.