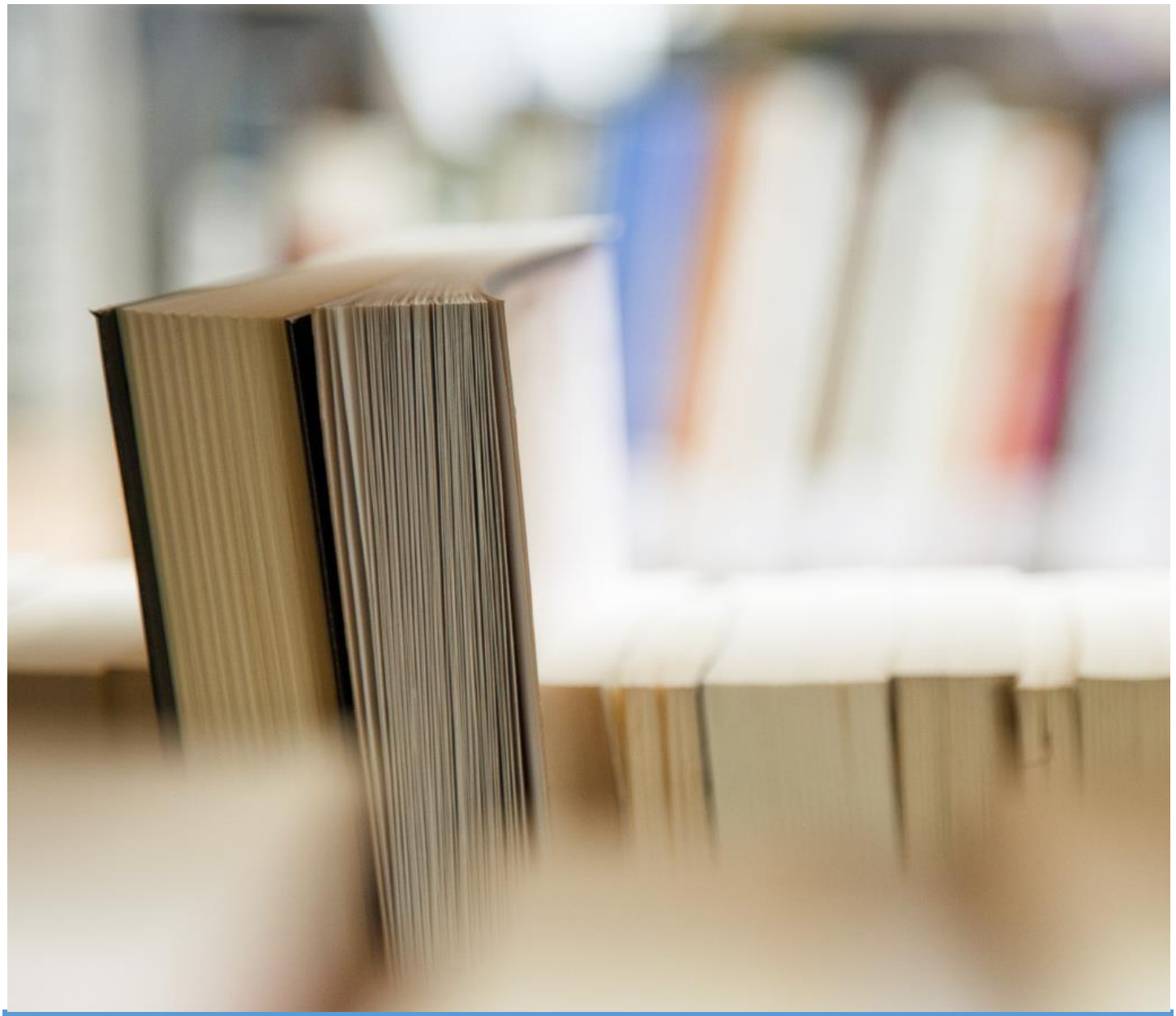


2016 BATCH QUESTION BANK

SEMESTER 7, 2019-2020

Staff Advisors:- Ms. Sreejitha S. G. and Mr. Dawn Sivan

QUESTIONS COMPILED BY

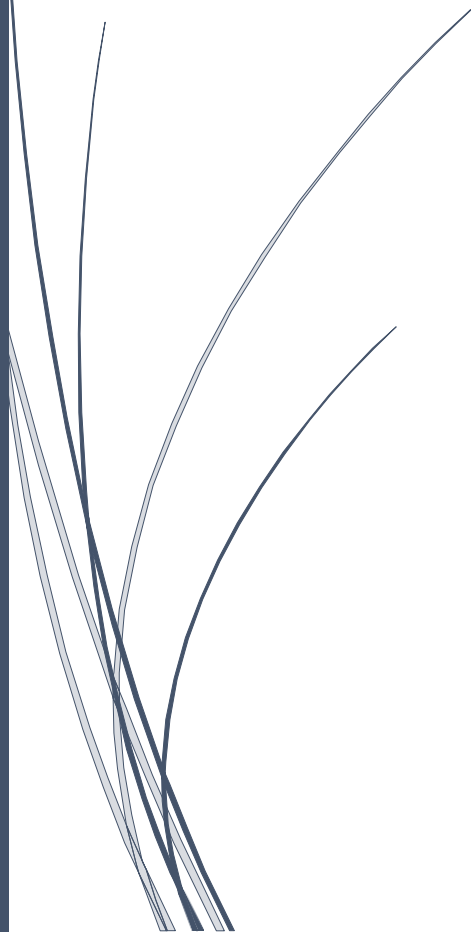
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VIDYA ACADEMY OF SCIENCE & TECHNOLOGY TECHNICAL CAMPUS, KILIMANOOR

2016 Batch S7
(2019 – 2020)

EC 401 INFORMATION THEORY AND CODING

Faculty - Ms. Anjana N.



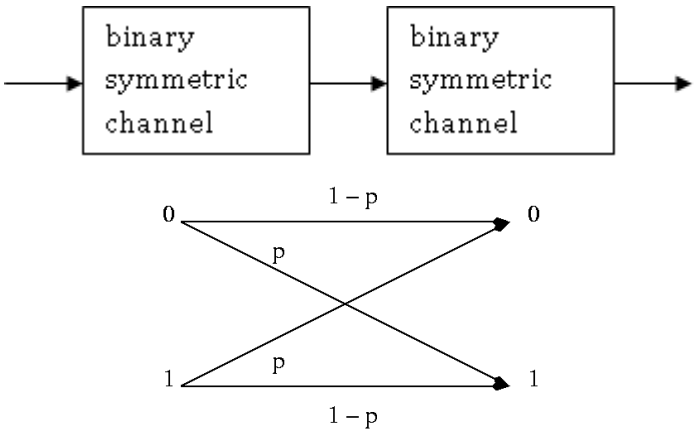
EC 401 Information Theory and Coding

Module 1

Sl No	QUESTIONS	Marks
1.	Obtain the relation for H(Y/X) of a communication channel	5
2.	Explain the terms: Amount of information, entropy and mutual information.	5
3.	State Kraft's inequality. Also explain source coding Theorem and code rate	5
4.	Derive the equations of conditional entropies H(X/Y) and H(Y/X). Hence show that H(X, Y) =H(X)+ H(X/Y)+H(Y)+ H(Y/X).	10
5.	Explain source coding and its properties	10
6.	Define information with different units. Compare the different units of information	5
7.	Write the properties of instantaneous code with examples.	5
8.	A discrete memory less source has an alphabet of five symbols with there are given by, [X] = [X1, X2, X3, X4, X5] ; [P] = [0.45, 0.15,0.15,0.10,0.15]. Compute Entropy & second order Extension for the Symbol. Find the amount of Information gained by observing the source.	10
9.	A Source emitting 4 symbols with probability 0.4, 0.3, 0.2, and 0.1. Find the amount of information gained by observing the source.	5
10.	Prove that maximum entropy of M messages can be obtained when messages are equally probable.	5

Module 2

11.	State & Explain Shannon first theorem. Discuss its limitations.	5
12.	Write short notes on: (a) Binary Communication channel (b) Binary symmetric channel.	7
13.	Determine the code efficiency for the two alternatives?	5
14.	Consider a sequence of letters of English alphabet with their probabilities of occurrence as given here letters = [a, b, c, d, E, f, g, h]; [P] = [0.1 0.1 0.2 0.1 0.1 0.2 0.1 0.1]. Compute two different Huffman codes for this source. For these two codes find • Average code word Length • Variance of average code word. • Entropy	10

15.	What is coding? Explain the steps involved in Shannon Fano coding. What are the disadvantages of fano coding?	5
16.	Compare Shannon fano coding with Huffman coding. Construct optimum code using Huffman coding with following data. Let S={S1,S2,S3,S4,S5} occur with probabilities P={0.55, 0.15, 0.15, 0.10, 0.05} ,X={0,1}. Draw the code tree.	7
17.	Write notes on: a. Huffman coding b. Capacity of band limited Gaussian channels	10
18.	Compare Huffman coding and Shannon fano coding for a DMS with 6 symbols with probabilities {0.3, 0.25, 0.2, 0.12, 0.08, 0.05}.	7
19.	State and prove the Upper bound & lower bound of Entropy.	5
20.	Two binary symmetric channels are connected in cascade as shown in figure below. Find the overall channel capacity of the cascaded connection assuming both channel has same transition probability diagram. 	10

21.	a) State Shannon's channel coding theorem. Give its positive and negative statements. b) An information source produces sequences of independent symbols A,B,C,D,E,F,G with corresponding probabilities 1/3,1/27,1/3,1/9,1/9,1/27,1/27. Construct a binary code and determine its efficiency and redundancy using • Shannon –Fano coding procedure • Huffman coding procedure.	10
22.	What is meant by a symmetric channel? How do we find the capacity? Discuss binary symmetric and binary erasure channel? Draw the channel diagrams	7

	and derive the expressions for their channel capacities.	

Module 3

23.	What is shannon's limit? Explain its significance.	5
24.	Compare analytically the different channels available for communication	5
25.	According to the Shannon-Hartley law, what is the maximum achievable bit-rate for a computer modem operating over a telephone channel with 3 kHz bandwidth and a maximum allowed signal power that guarantees only a 30dB SNR?	7
26.	State an explain shannon hartley theorem	5
27.	Write the properties of mutual information.	5
28.	Show that, according to the Shannon-Hartley law, if the signal power is equal to the noise power, the channel capacity in b/s is equal to the bandwidth B Hz.	6
29.	Assuming a usable bandwidth of 0 to 3 kHz with AWGN and a 2 sided noise PSD of $N_0/2$, design a simple modem (using M ary signalling with M=5) for transmitting 30kb/s with a SNR of 30dB. What is the bit error rate? If this BER is too high for your application, how could you reduce it?	7
30.	A channel has an SNR of 15. If the channel bandwidth is reduced by half, determine the increase in the signal power required to maintain the same channel capacity.	7
31.	The parity matrix of a (6,3) linear systematic block code is given below. $P = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$ Construct standard array. State and derive Shannon-Hartley theorem. Explain the implications.	10
32.	a) Derive the expression for channel capacity when bandwidth becomes infinite. b) A voice grade channel of the telephone network has a bandwidth of 3.4 KHz. (a) Calculate channel capacity of the telephone channel for signal to noise ratio of 30 dB. (b) Calculate the minimum SNR required to support information transmission through the telephone channel at the rate of 4800 bits/sec.	20
33.	a) Define ring and field. Discuss properties. b) The parity matrix for a (7,4) linear block code is given below:	20

	$[P] = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$ i) Find generator and parity check matrices ii) Draw the encoder circuit. iii) Sketch the syndrome calculation circuit iv) Illustrate the decoding of the received vector corresponding to the message vector 1001, if it is received with 5th bit in error.	

Module 4

34.	What is a Linear Block code? How you decode the Linear Block code?	6
35.	What is syndrome? What are the properties of Syndrome	5
36.	The parity check matrix of a particular (7,4) linear block code is given by, H = 1 1 1 0: 1 0 0 0 1 1 1: 0 1 0 1 1 0 1: 0 0 1 a. Find the generator matrix b. List all the code vectors c. What is the minimum distance between odd vectors? d. how many errors can be detected? e. how many errors can be corrected?	20
37.	The parity check matrix of a (7,4) hamming code is given as follows: H = 1 1 1 0: 1 0 0 0 1 1 1: 0 1 0 1 1 0 1: 0 0 1 Calculate the syndrome vector for single bit errors?	7
38.	Explain why decoding based on standard array is maximum likelihood decoding or minimum distance decoding.	6
39.	The generator polynomial for a cyclic code is $g(x)=1+x+x^3$ • Find the code vector in systematic form for the message vector=[1 1 0 0] • Design an encoder for the code	10
40.	For a (6,3) linear block code, construct the standard array. What are the importance coset leaders in standard array?	7
41.	A systematic (6,3) code has the following generator matrix	10

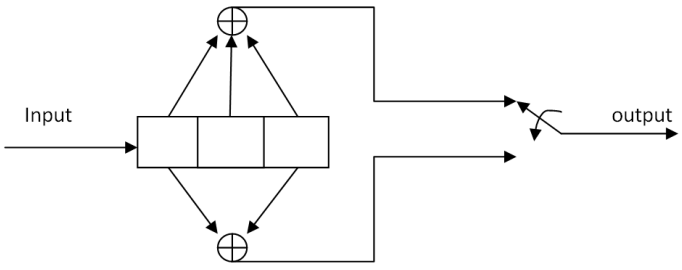
	$\begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$ Construct the standard array and determine the correctable error pattern	
42.	With the help of diagrams explain the working of ageneral decoding scheme for (n,k) block code.	10
43.	For a binary symmetric channel, find the probability of decoding error for a6,3 block code, with eror probability $1.37x10^{-3}$	10
44.	a) Draw a (2, 1,3) convolutional encoder with [1, 0, 1, 1] and [1, 1, 1, 1] as the impulse responses. Find the output of the convolutional encoder for input sequence 11011 using transform domain approach b) Given G(D) = [1, 1 + D + D^3], design a (2, 1, 3) convolutional encoder of rate = ½. c) Discuss properties of Hamming codes.	20

Module 5

45	Explain about Hamming code.	5
46	The generator polynomial of (7,4) cyclic code is ,G(P)=P3+P+1, Find all code vectors for all the code in non systematic form?	6
47	Explain the operation of encoders for cyclic codes?	5
48	Write short notes on: • BCH code • Reed Solomon code	6
49	Distinguish between Hamming distance and minimum distance for linear block code.	5
50	Construct the following for a non-systematic hamming codes • Parity check matrix • Generator matrix • Code words for messages from 0001 to 1100	10
51	Construct systematic and non systematic cyclic codes for a (7,4) cyclic code for messages 1011, 1111, 0011, 1100.	10
52	Explain encoding and decoding schemes using BCH codes.	7
53	Obtain systematic generator and parity check matrix for (7,4) cyclic codes. Draw the general decoder scheme for (n,k) cyclic codes.	10
54	Explain encoding and decoding schemes of hamming codes.	10
55	a) Construct a convolution encoder, given rate 1/3, constraint length L = 3. Given $g^{(1)}$ =	20

	(1 0 0), $g^{(2)}$ = (1 0 1), $g^{(3)}$ = (1 1 1). Sketch state diagram and trellis diagram of this encoder. b) Discuss syndrome decoding of cyclic code. Draw syndrome decoder circuit for a (15, 9) cyclic code with generator polynomial $g(X)= 1+ X^3+ X^4+ X^5+ X^6$	

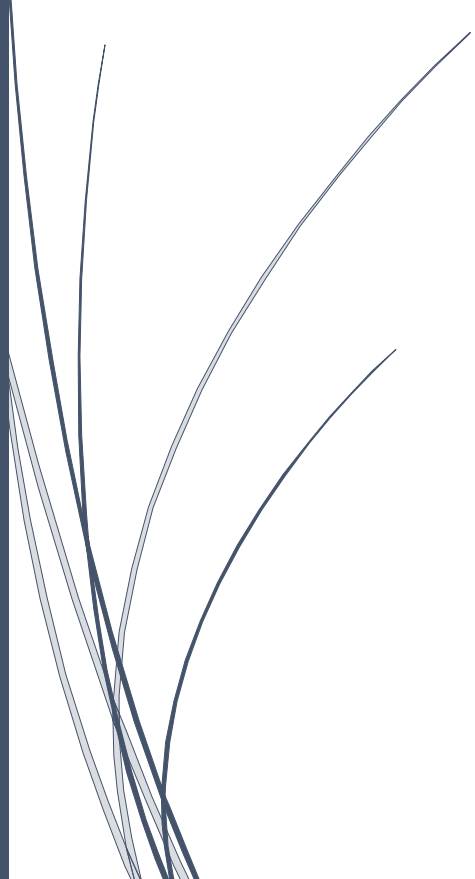
Module 6

56	Explain the concatenated block codes?	10
57	Explain the operation of Convolutional coding with an example?	10
58	A convolutional encoder has the following generating sequence, g(1)=[1 1 1], g(2)=[1 0 1]. Apply Viterbi algorithm for the decoding of the received sequence 1101110001100011.	7
59	List the different methods used for graphical representation of convolutional code.	5
60	For a (2, 1, 3) encoder with g(1)=(1101), g(2)=(1111), Draw the trellis for L=5.	6
61	A rate 1/3 non-systematic code has generator sequence as given below: g^{11}=(1101); g^{12}=(1001); g^{13}=1110 • Construct the encoder • Draw the code tree for the convolutional code.	10
62	Explain maximum likelihood decoding for a convolutional code.	10
63	Compare convolutional codes with block codes. Draw a (2,1,2) convo0lutional encoder and write the generator sequences.	7
64	Distinguish between a trellis diagram and tree diaram	7
65	A rate ½ k=3 binary convolutional encoder is shown in figure below  a. Draw the state diagram for the code b. Find the transfer function of the code c. Find the minimum free distance, d_{free} of the code.	20
66	a) Draw a (2,1,2) convolutional encoder with the feedback polynomials as $g_1(X)=1+X+X^2$ and $g_2(X)= 1+X^2$. Draw the code tree and trace output for input sequence 10011. b) Discuss generation of Hamming codes. c) What is minimum free distance of a convolutional code?	20

2016 Batch S7
(2019 – 2020)

EC 403 MICROWAVE & RADAR ENGINEERING

Faculty - Ms. Shilpa Das



EC 403 MICROWAVES AND RADAR ENGINNERING

QUESTION BANK 2019

Name of the Teacher: Ms. Shilpa Das

MODULE 1

1.	Derive the relation between repeller voltage and accelerating voltage for reflex klystron	12
2.	Discuss the advantage of microwave over low frequencies	4
3.	Derive the equation for the cutoff frequencies for TE-mn mode in a rectangular wave guide	8
4.	Derive the resonant frequencies of circular cavity	9
5.	Show that co axial cavity can support infinite no of modes	4
6.	Give application of cavity resonator	4
7.	Calculate the resonant frequencies of a circular resonator with diameter 12.5cm length 5cm for TM 012 mode.	5
8.	Explain the function of circular wave guide.	4
9.	Explain the significance of re-entrant cavities in microwave tubes. What are the different types of re-entrant cavities?	6
10.	Draw the diagram and derive expression for power output and efficiency of two cavity klystron	10
11.	Draw the Applegate diagram of the klystron and explain	3
12.	Explain the depth of velocity modulation	6
13.	A two cavity klystron operates at 5 ghz with dc beam voltage 10 KV cavity gap 2mm.For a given input RF voltage the magnitude of gap voltage is 100 v calculate the transit time of the cavity gap, transit angle and velocity of electrons leaving the gap	12
14.	A two cavity klystron amplifier has the following efficiency V0=1000v.R0=40 k,i0=25mA f=3ghz,gap spacing=1mm spacing between cavities L=4 cm.Effective shunt resistance =30k Find efficiency	10
15.	A reflex klystron operates at a peak of n=2 mode/The DC power input is 50mW and V1\V0 =3.if 20% of power delivered by the beam is dissipated in the cavity	8

walls. Find the power delivered to the load

16. Derive the power and output efficiency of two cavity klystron 9
17. Explain the process of velocity modulation in klystron. Derive the expression for some 12
18. A two cavity klystron has the following specification
    Beam voltage V0=900V, Beam current=30 mA, freq=8ghz, gap spacing d=1mmspacing between centers of cavities l=4cm, Effective shunt impedance =49 ghz Determine the electron velocity, dc transit time of electrons 12
19. A two cavity klystron amplifier has the following parameters,beam voltage 1200V ,Beam current=28ma,frequency 8 ghz,gap spacing in either cavity 1mm,spacing between cavities =4cm.effective shunt resistance Rsh =40k find voltage gain,efficiency of the amplifier 8
20. Explain why conventional tubes can't be operated at high frequencies and how these effects are taken cared in klystron .Explain the bunching process in klystron 15

MODULE 2

1. r 4 ¾ mode repeller voltage is 125V .Find the repelled voltage for5 ¾ mode (3 ¾) .if anode voltage V0=300v 5
2. reflex klystron operates at peak of n=1 or ¾ mode .the dc power input is 40 mW and the ration of V1 over V 0 is 0.278 10
3. ɔm the equivalent circuit of reflex .Find the condition on electronic admittance to produce oscillation ,plot the admittance in rectangular coordinates 7
4. reflex klystron operates under the following condition, V0=600V,L=1mm Rsh+15k ohm,fr=9 GH.The tube is oscillating at fr at the peak of n=2 or 13/4 mode. Assume the transit time through the gap and beam loading can be neglected. 8
5. ɛduce the expression for electronic admittance of reflex klystron. Draw the electronic admittance spiral of a reflex klystron and explain 6

6. plain the working of reflex klystron using neat sketches? What are the different 12

	modes observed	
7.	plain the operation of reflex klystron to produce oscillation? Give expression for efficiency.	7
8.	aw the Applegate diagram of the klystron and explain	3
9.	plain the process of velocity modulation in reflex klystron	5
10.	plication of magnetron	2
11.	ith diagram explain the working of cylindrical magnetron operation mechanism.	8
12.	aw the equivalent circuit and derive the expression for out power and efficiency	4
13.	rive the following expression a) cyclotron angular frequency b) power output c)efficiency	10
14.	hy strapping is employed in magnetron	4
15.	st the performance characteristic and application of magnetron	4
16.	plain how mode jumbling can be suppressed in magnetron	5
17.	hat is TT mode of operation in magnetron	10
18.	n v band pulsed cylindrical magnetron the following operating anode voltage Vo=36Kw, Beam current Io=27A Magnetic flux density Bo=.336Radius of the cathode a=5cm.Find cyclotron angular frequency, Cutoff magnetic flux density	9
19.	assification of magnetron	7
20.	How oscillation generate in reflex klystron?	8

MODULE 3

1.	hat are slow wave structures? How can a helical TWT achieve microwave amplification?	8
2.	ith the diagram explain the amplification process in TWT What is the significance of electronic and circuit equation	9
3.	rive the convection current in electron beam of Helix TWT	8
4.	plain the working of helix travelling wave tube amplifier	9
5.	ith schematic diagram explain the amplification process of helix travelling wave tube	5
6.	plain the measurement of impedance ,frequency and power	8

7.	hat is the type of slow wave structures?	9
8.	travellingwave tube operates under the following parameters Beam voltage Vo =3kv beam current Io =30ma characteristic impedance of helix zo =10 circuit length n=50 frequency f=10 ghz,a)determine gain parameter c.b)output power gain Ap,c)all four propagation constants	8
9.	fferentiate between klystron and TWT.	7
10.	plain how helical coil used in slow wave structures	8
11.	hy convention tube cannot be used in high frequencies?	8
12.	hat is the basic principle of TWT amplification	5
13.	ve the working principle of Microwave frequency meter	6
14.	ith simple laboratory microwave bench setup .How frequency of a wave is measured	7
15.	hat are the various methods for the measurement of power and frequency?	8
16.	ith the aid of smith chart explain how impedance is measured	8
17.	hat is phase velocity? amplification	9
18.	helical TWT has diameter of 2mm with 50 turns per cm a) calculate axial phase velocity and anode voltage at which the TWT can be operated	9
19.	rive the circuit equation and electronic equation of TWT	6
20.	plain the amplification occurred in TWT? Whyhelix is preferred?	2

MODULE 4

1.	plain the operation of wave guide bend and twist.	5
2.	plain the operation of microwave circulators	4
3.	hat is magic TEE	3
4.	rive the S matrices of directional coupler	6
5.	hy is hybrid E H plane referred to as Magic Tee. Derive the scattering parameters of magic tee	7
6.	stinguish between E plane TEE and H plane TEE	7
7.	plain two hole directional coupler and obtain its matrix	6
8.	aw the diagram and explain the working of circulators and isolators.	7
9.	rite s matrix of directional couplers. Explain the working of two hole directional	7

	couplers	
10.	plain four port circulators	10
11.	fine the term coupling factors and directivity.	4
12.	hat is Faraday rotation amplification	4
13.	plain Faraday rotation isolator.	3
14.	rive the s matrices of 3 port circulators.	2
15.	fine coupling factors, insertion loss directivity associated with directional couplers.	6
16.	symmetric directional coupler with infinite directivity and a forward attenuation of 20 db is used to monitor the power delivered to the load zl introduces a vswr of 2.0 arm 4 .bolometer 2 is matched to arm 3 .if bolometer 1 read 8 mw and bolometer 2 reads 2 mw find the amount of power dissipated in the load zl	10
17.	orking principle of Microwave isolators	9
18.	vo identical directional couplers are used in waveguide to sample incident and reflected powers. The output of the two couplers is found to be 2,5mw and .15mW.Find the value of VSWR in waveguide.	8
19.	vo identical directional couplers are used in waveguide to sample incident and reflected powers. The output of the two couplers is found to be 3 mw and .1mW.Find the value of VSWR in waveguide. What is the value of the reflected power	8
20.	ith neat sketch explain the impedance measurement of magic TEE	6

MODULE 5

1.	plain the working principle of tunnel diode	5
2.	st the application of microwave solid state Devices	6
3.	scribe the working of tunnel diode	8
4.	ith equivalent circuit of tunnel diode explain series loading and parallel loading	9
5.	plain the power frequency Limitation	8
6.	plain how tunnel diode work as amplifier with suitable microwave components	5
7.	plain the working of Gunn diode oscillator	8
8.	plain how Gunn diode act as an oscillator	8
9.	hat are the different modes of operation in Gunn diode	8

10.	ve the reason why Ga As MESFET perform better than Si MESFET	9
11.	aw the small signal equivalent circuit of MESFET. Also comment on drain current and transconductance	9
12.	rite down the expression for the drain current of Shottky barrier gate MESFET and describe the terms.	6
13.	hat are MESFET? Explain the performance characteristics and their application	7
14.	rite note on switching speed and power handling capability of P I N diode	8
15.	plain the power frequency ,current frequency and power gain frequency limitation with reference to a microwave transistor	12
16.	plain how PIN diode can be used as SPDT switch	12
17.	st the difference between transistor and TED s	5
18.	scribe the structure of microwave bipolar transistor	8
19.	scuss the factors that limit high frequency response of BJT	5
20.	n type GA As Gunn diode has the following parameters. ectron drift velocity, Vd =2.5 m/sec.Negative electron mobility mn =.015.Relative dielectric constant er=13.1 .Determine the criterion for classifying the modes of operation	9

MODULE 6

1.	plain the basic principles of radar system and derive the radar range equations.	7
2.	plain the action of CW Doppler, FMCW Doppler radar. Dicuss their application and limitations	9
3.	rite short note on LORA	8
4.	aw the block diagram of a simple radar and explain it.Write the advantage limitation and application of radars	9
5.	plain simple radar equation	5
6.	ith neat block diagram explain the pulse radar	12
7.	plain with block the working of super heterodyne receiver,	7
8.	ort note on MTI radar	8
9.	plain MTI radar with power amplifier and power oscillators	9
10.	plain Delay line cancellers	8

11.	ith block diagram explain briefly radar transmitters, Modulators. Radar receivers	7
12.	plain the different types of displays in radar communication	7
13.	plain the principle of Duplexers with block diagram	7
14.	Derive the minimum detectable signal of a RADAR	5
15.	ort note on DME(Distance measuring equipment)	10
16.	detail with diagram the working of Instrument Landing system	9
17.	What are low noise front ends? Describe in detail the utility of low noise front ends.	8
18.	hat is Glide slope?	8
19.	What is Doppler effect? Derive the equation for Doppler efficiency.	9
20.	rive the equation for noise figure and low noise front end	8

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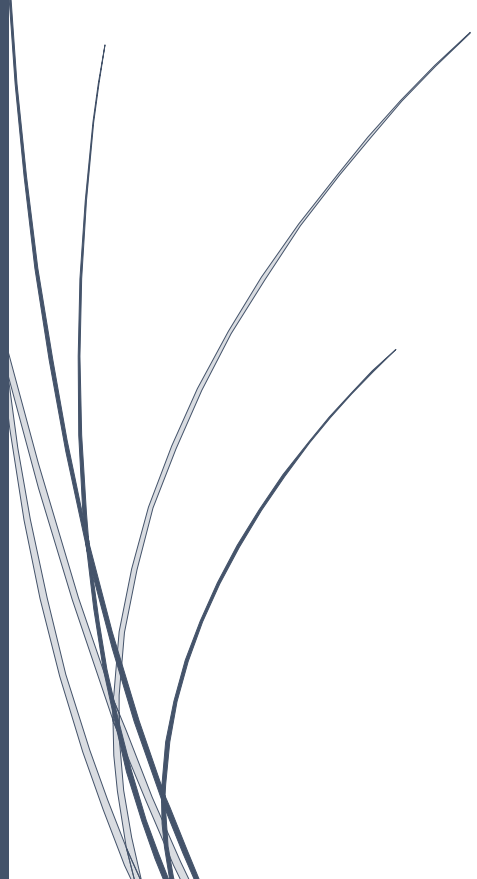
2016 Batch S7
(2019 – 2020)

EC 405 OPTICAL COMMUNICATION

Faculty – Mr. Chandu C. B.



SUBJECT: EC405 OPTICAL COMMUNICATION

MODULE I

1 Differentiate between graded index and step index fiber.

2 A multimode step index fiber with core diameter 60μm and relative refractive index of 1% is operating at 0.80μm.Determine normalized frequency parameter of the fiber.

3 a) Express the pulse spreading time caused by modal dispersion in terms of relative refractive index.

b) Calculate the pulse spreading due to modal dispersion and the maximum number of bits/second,that can be transmitted over 1 Km with a step index fiber if NA=0.2 and n1=1.486.

4 List the major causes of attenuation in an optical fiber and explain.

5 Explain intramodal and intermodal dispersion in optical fiber.

6 Find the core radius of single mode operation at 1320nm o a step index fibre with n1=1.48 and n2=1.478. What is the maximum acceptance angle of the fiber.

7 A multimode fiber with 50 micrometer core diameter is designed to limit the intermodal dispersion to 10ns./km. What is the numerical aperture of this fiber? What is the limiting bit rate for transmission over 10km at 0,88 micrometer. Let the refractive index of core be 1.45.Also find the number of modes supported.

8 What do you mean by numerical aperture. Write am expression for that.

9 Describe an optical fiber with a diagram

10 Describe the intermodal and intramodal dispersion in optical fiber.

11 How we can classify optical fibers in accordance with refractive index profile?

12 What are photonic crystal fibers? Explain the classification of PCF with neat diagrams.

13 What is dispersion? Explain the different types of dispersion .Why single mode fiber are used in commercial communication systems?

MODULE II

1 What do you mean by modes in a laser diode? Explain.

2 A detector is provided with the following data. (i) operating wavelength= 850nm

3 (ii) output current = 85μm (iii) power of light beam= 850μW. Dtermine responsivity

4 With neat sketches explain LED characteristics and derive the expressions for internal and external quantum efficiencies.

5 Explain the working of a semiconductor laser using suitable diagram

6 The refractive index of a material used for fabricating an LED is 3.5. calculate its external quantum efficiency

7 With a neat diagram explain the Laser Diode structure and its radiation pattern. Also explain the modulation of laser diode and laser linewidth.

8 Explain about the amplified spontaneous emission noise and the effects of laser diode non linearity.

9 Compare spontaneous emission and stimulated emission of LASER.

10 Explain the different types of scattering losses.

11 What is Amplifier Spontaneous Emission Noise?

MODULE III

1 Compare Avalanche photodiode and PIN photodiode.

2 Define responsivity of photodiode. Photons of energy 1.53×10^{-19} J are incident on a photodiode which has a responsivity of 0.65 A/W. If the optical power level is 10μW,find the photocurrent generated.

3 Explain the terms responsivity and quantum efficiency of a photodetector.

4 With suitable diagrams explain operation of PIN and APD.

5 An APD has quantum efficiency of 45% at 0.85μm. When illuminated with radiation of wavelength it produces an output photocurrent of 10μA after avalanche gain with a multiplication factor of 250.Calculate the received optical power to the device.

6 List the requirements of a photodetector

7 What are the different sources of noise in photodetectors

8 Define noise equivalent power and detectivity of photodetector

9 Draw and explain avalanche photodiode structures and electric field in depletion and multiplication region.Also explain avalanche multiplication noise

10 Draw the equivalent circuit of an optical receiver and explain the related terms. With the help of necessary figures, describe the working of an IMDD system.

MODULE IV

1 What is Gordun Haus effect?

2 Assume a soliton loght wave system required to operate at 10 Gbps and span a total transmission distance of 10000km, What is the required pulse width of the soliton assuming negligible soliton intercatio. Assume Z0 = 1000km

3 Draw the block diagram of a soliton communication link. What are the design constraints,

4 List out the merits of Soliton communication system

5 Explain briefly GH effect, Soliton lasers

6 What are the design guide lines of soliton based links

7 Describe the design of IMDD links

8 Describe about the sensitivity of a coherent receiver

9 Compare quantum efficiency and responsivity of pin diode.

10 Write the basic concept of solition generation, and also write the advantages of soliton based communication system

MODULE V

1 Explain the basic concept of optical amplifiers

2 What are the different types optical amplifiers

3 What are the advantages of semiconductor optical amplifier

4 Explain the different possible applications of optical amplifiers in a practical optical communication system.

5 Explain how amplification mechanism takes place in EDFA amplifiers

6 Explain Raman amplifiers

7 Briefly describe the TDFA amplifier

8 What are optical Amplifiers? Explain the Working any two with neat diagrams.

9 What are the advantages of SOA over EDFA?

10 What is a grating? A plain transmission grating possess 5000 rulings /cm. What is the angle of second order diffraction produced by the grating for a wave

11 length of 1550 nm?

12 What is a tunable optical filter?

Explain the working of EDF A with necessary diagrams.

MODULE VI

1 Explain the concept of WDM and explain the system features

2 Discuss splitters and couplers

3 Explain the concept of demultiplexing function using a fiber grating and an optical circulator.

4 Explain with diagrams the method of multiplexing four wavelengths using fiber Bragg grating and circulators.

5 Explain the function of OTDR with neat diagrams

6 Explain LiFi technology

7 Explain VLC

8 Explain the architecture of WDM system and explain the different components of WDM

9 Explain the importance of ADM, AWG and wavelength tunable sources in WDM systems.

10 Explain the working principle of OTDR. How refractive index is calculated using it?

11 Explain the principle of Raman Amplifier. What are the advantages and (5) disadvantages of Raman amplifier?

12 Explain add/drop multiplexers.

13 With block diagram explain free space optical communication system. Write the advantages and disadvantages of the system.

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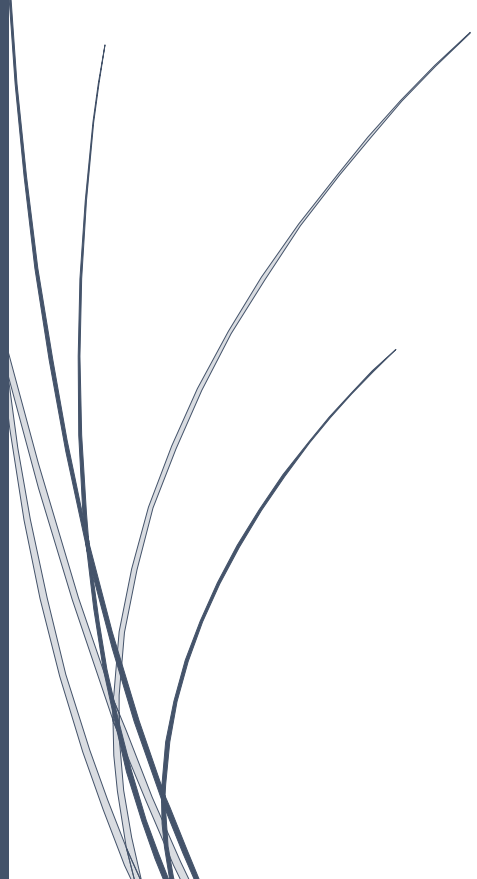
EC 407 COMPUTER COMMUNICATION

Faculty – Mr. Rajesh G. R.



Subject: EC 407 Computer Communication

MODULE I

		Marks
1.	Explain the types of transmission modes	10
2.	What is network topology? Explain the different network topologies	10
3.	What are the different types of networks? Explain in detail.	10
4.	With a neat diagram, explain OSI reference model.	10
5.	Explain the tcp/ip reference model with neat diagram	10
6.	Write notes on a). Packet switching b). Message switchingc). Circuit switching	10
7.	What are the criteria for successful network performance management?	10
8.	Explain Network Interconnection	10
9.	What is Network Architecture? Explain the various types of Network Architecture.	10
10.	Explain in details i) stop and wait ARQ ii) Go – back – N ARQ iii) Selective repeat protocol	10
11.	What are the different framing methods? Compare and contrast bit stuffing and byte stuffing with frame structures.	10
12.	What are the different components of a computer network? Explain.	10

MODULE II

		Marks
1.	Explain different types of Data link layer framing mechanisms.	10
2.	Explain the Shielded twisted pair (STP) and Unshielded twisted pair(UTP)	10
3.	Explain the fiber optic cable in detail.	10
4.	Discuss about the sliding window protocol with neat diagram in detail.	10
5.	Explain how Stop and Wait flow control works together with Stop and Wait error control to manage data transmission on a data link layer connection.	10
6.	Describe the error detecting and correcting techniques employed in data communication.	10
7.	Explain in detail about the frame format and control field of HDLC	10
8.	What is CSMA/CD? How does it work? Distinguish between 1-persistent and non-persistent CSMA.	10
9.	Explain Ethernet protocol (802.3).	10
10.	Explain MAC sub layer protocol and frame structure of IEEE 802.11.	10 10

11.	Explain with flow diagram how collision is avoided in CSMA method. Compare and contrast CSMA/CD with CSMA/CA.	10
12.	Explain how framing is done by data link layer.	

MODULE III

		Marks
1.	Explain classfull addressing and classless addressing	10
2.	What is IPv6? Explain the advantages over IPv4. Also explain its frame format	10
3.	Draw the sketch of IPv4 packet header and explain	10
4.	Briefly explain IGMP message format and IGMP operation.	10
5.	Discuss about ARP and RARP	10
6.	Describe the functionalities of the network layer. Explain the IP packet format with a neat diagram.	10
7.	Design a network using Switches, Routers and Bridges.	10
8.	Explain the following i) DHCP ii) Message format and error reporting of ICMP	10
9.	Define Switch and Routing. Explain how you would use them for connecting the Network.	10
10.	Explain subnetting and supernetting. How do the subnet mask and supernet mask differ from a default mask in classful addressing?.	10
11.	What is a Virtual LAN (VLAN) and What Can It Do?	10
12.	What is CIDR? Explain with Example	10

MODULE IV

		Marks
1.	What are the different types of routing algorithms?	10
2.	Explain distance routing algorithm with an example	10
3.	What is routing and explain static and dynamic routing algorithm.	10
4.	What is a RIP? Explain in detail about RIP and OSPF with diagrams. Can you distinguish between them?	10
5.	Illustrate shortest path algorithm? Explain the same with suitable diagrams and examples	10
6.	Categorize the function of BGP? Explain in detail BGP with categories	10
7.	What would you recommend for the building and distribution of link state packets in link state routing algorithm?	10
8.	What is MPLS and How Does It Work?	10
9.	What is Open Shortest Path First and explain its function.	10
10.	Explain IPv4 and IPv6 datagram formats	10
11.	How can we distinguish a multicast address in IPv4 addressing?	10
12.	How can we do so in IPv6 addressing? with the help of an example,	10

explain the CIDIR scheme.

MODULE V

		Marks
1.	Describe the working principle of TCP congestion control.	10
2.	Discuss the flow control mechanism with an example.	10
3.	Explain about UDP with neat sketch on it.	10
4.	Examine the concept of congestion avoidance in TCP?	10
5.	With neat diagram, explain the TCP connection establishment in the normal case and call collision case	10
6.	Explain in detail window management in TCP	10
7.	Define QOS. Elaborate the characteristics of QOS.	10
8.	Describe how SMTP protocol is used in E-mail applications	10
9.	Draw the architecture of WWW and explain the various blocks in detail.	10
10.	Explain HTTP with example.	10
11.	Draw the TCP segment header format. explain the various fields in the TCP segment header	
12.	Explain the various congestion control mechanisms to alleviate congestion after it happens.	

MODULE VI

		Marks
1.	What are the differences between passive and active attack? Determine the security services required to counter these attacks?	10
2.	What are the protocols that provide security for e-mail? explain	10
3.	Explain two types of firewalls.	10
4.	Explain the network layer security.	10
5.	When we talk about authentication in PGP, do we mean message authentication or entity authentication? Explain.	10
6.	Compare and contrast PGP and S/MIME. What are the advantages and disadvantages of each?	10
7.	What are the two protocols that provide security at the transport layer?	10
8.	What is the purpose of a firewall and its limitations?	10
9.	What is SSL and TSL security? Discuss in detail	10
10.	Discuss about the Intrusion Detection Systems?	10
	Explain the handshake protocol used in SSL.	
	What is IPsec? Explain the two modes of operation in IPsec.	

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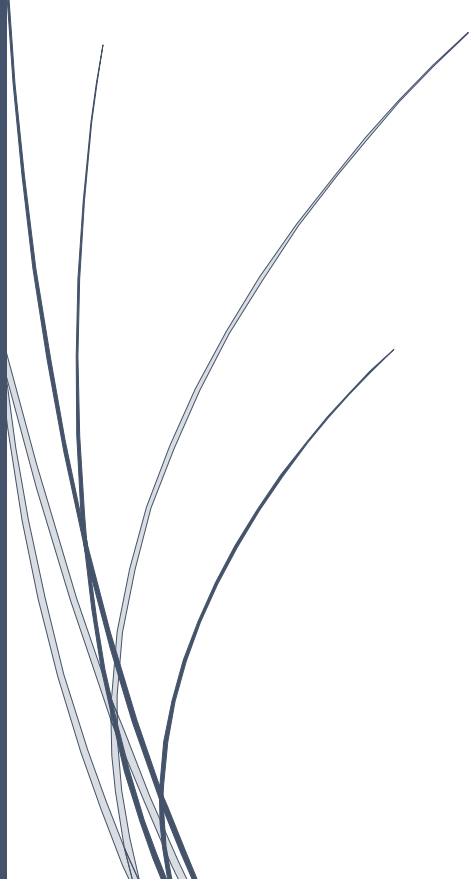
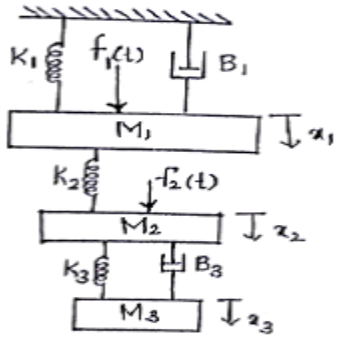
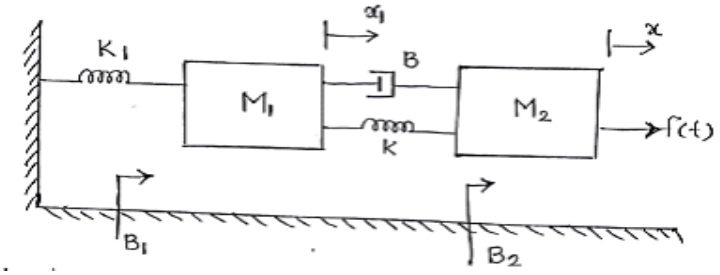
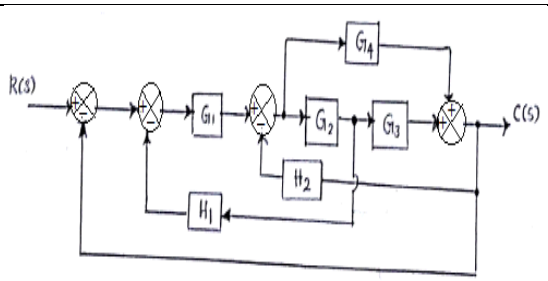
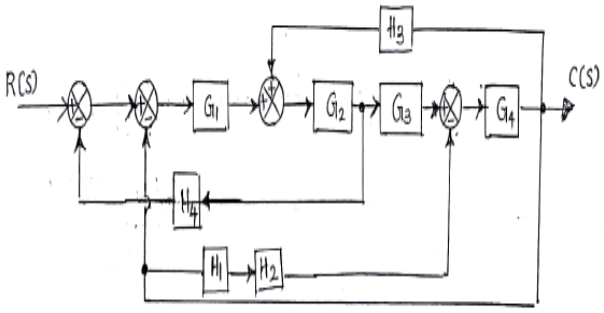
EC 409 CONTROL SYSTEMS

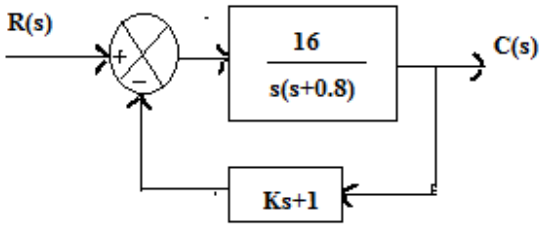
Faculty – Ms. Sreejitha S. G.



EC 409 CONTROL SYSTEMS

MODULE I			
Sl. No	**Questions**	**Marks**	**KTU/KU (Month/Year)**
1	Write the differential equations governing the mechanical system in the figure. Draw the force voltage and force current electrical analogous circuits 	5	KTU APRIL2018
2	Write the differential equations governing the mechanical system in figure and determine the transfer function. 	5	KTU Dec 2017
3	Give a comparison between open loop &closed loop control systems		KTU Dec 2017
4	Convert the block diagram to signal flow graph and determine the transfer function using Mason's gain formula.	10	KTU Dec 2017

			
5	Using block diagram reduction technique find the transfer function C(s)/R(s) for the system shown in fig. 	10	KTU Dec 2017
6	Basic Components of feedback control system		KTU Dec 2017
7	Convert the elements of rotational mechanical system to electrical system by torque current analogy		KTU APRIL2018
8	Draw the signal flow graph for the following sets of algebraic equation $x_1 = ax_0 + bx_1 + cx_2$, $x_2 = dx_1 + ex_3$, $x_3 = fx_0 + gx_2$, $x_4 = hx_3$,	5	KTU DEC 2018
	MODULE II		
1	A positional control system with velocity feedback is shown in figure .What is the response c(t) to the unit step input. Given that $\zeta = 0.5$. Also calculate rise time, peak time, maximum overshoot and settling time.	5	KTU APRIL2018

			
2	Derive the response of under damped second order system for unit step input	5	KTU Dec 2017, KTU Dec 2018
3	Derive the response of first order system for unit step input	10	KTU Dec 2017
4	Derive the relation between generalized error and static error coefficient	4	KTU APRIL2018
5	Obtain the unit ramp response of system	8	KTU Dec 2017
6	Explain the effect of location of roots in s plane	6	KTU Dec 2017
7	Calculate the resonant peak and resonant frequency for second order system for wn= 0..5 and 8 rad/s	4	KTU APRIL2018
8	Determine the step, ramp and parabolic error constants for the unity feedback control system. G(s) = $\frac{10(s+2)}{(s+1)s^2}$	5	KTU DEC 2018
	MODULE III		
1	Write short notes on phase margin and gain margin	5	KTU APRIL2018
2	List the steps of bode plot of lead compensator	5	KTU APRIL2018
3	What is root locus .What are the information's obtained from it	4	KTU APRIL2018
4	State and explain Nyquist stability criterion	4	KTU July2017
5	Find the stability of the system for the characteristic equation given by:	4	KTU July2017
6	Write any four frequency domain specifications	5	KTU July2017
7	A positional control system with velocity feedback is shown in figure .What is the response c(t) to the unit step input. Given that ζ = 0.5.Write the TF of PID Controller	5	KTU Dec 2017
8	Sketch the root locus for a system G(s).H(s)= K/s(s+2)(s^2 +2s+2)	10	
9	Using Routh Hurwitz Criterion, determine the no of roots in the right half of s plane. $S^4 + 2S^3 + 10S^2 + 20S + 5=0$	5	KTU DEC 2018
	MODULE IV		
1	Derive the response of under damped second order system for unit step input	10	KTU APRIL2018
2	Derive the response of first order system for unit step input	6	KTU APRIL2018
3	What is root locus .What are the information's obtained from it	5	
4	State and explain Nyquist stability criterion	5	
5	Plot the bode diagram for the following transfer function and find the gain margin and phase margin	10	KTU DEC 2018

	G(s) = 10/ S(1+0.4S)(1+0.1S)		
6	Write any four frequency domain specifications	4	KTU APRIL2018
7	A positional control system with velocity feedback is shown in figure .What is the response c(t) to the unit step input. Given that $\zeta = 0.5$. Write the TF of PID Controller		
8	Compare P, PI, PID Controllers	5	KTU DEC 2018
9	Draw the Nyquist plot for the system whose open loop transfer function is G(s)H(s) = k/ s(s+2)(s+10). Determine the range of k for which the closed loop system is stable.	8	KTU DEC 2018
10	Describe the design procedure of a lead compensator	7	KTU DEC 2018
	MODULE V		
1	Find the Z transform of the sequence x(n)={1,2,3,-1,5,6}	6	KTU APRIL2018
2	Find inverse Z Transform of X(Z) = z/{2z^2 – 3z +1} .|z| <1/2	4	KTU APRIL2018
3	Verify the time shifting property of Z transform and hence find the Z transform of x(n)=a^n+1 u(n+1)	10	KTU Dec2017
4	Find the Z transform and ROC of x(n) =(1/3)^n u(n)	5	KTU Dec2017
5	Find the inverse Z transform of X(z) = 3Z^-1/(1-z^-1)(1-2z^-1)	5	KTU Dec2017
6	Find the Z transform of the sequence x(n)={1,2,3,-1,5,6}	6	KTU July 2017
7	Find the Z transform of the sequence x(n)={1,2,3,-1,5,6}	5	KTU July 2017
8	Verify the time shifting property of Z transform and hence find the Z transform of x(n)=a^n+1 u(n+1)	4	KTU July 2017
9	A dynamic system s represented by the state equation. $X=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ 0 & -2 & -3\end{bmatrix} \quad X+\begin{bmatrix}0\\0\\1\end{bmatrix} r$ Check whether the system is completely controllable	5	KTU DEC 2018
10	What is transfer function of a control system? Derive the expression for transfer matrix	7	KTU DEC 2018
11	Obtain the state model for the given transfer function $\frac{Y(s)}{U(s)} = \frac{1}{s^2+s+1}$	8	KTU DEC 2018
	MODULE VI		
1	Obtain about zero order hold and first order hold	6	KTU APRIL2018
2	Derive the describing function of saturation nonlinearity	4	KTU APRIL2018
3	Determine the range of K for which the closed loop system is stable	5	KTU APRIL2018
4	What is root locus .What are the information's obtained from it	5	KTU APRIL2018
5	State and explain Nyquist stability criterion	10	KTU Dec 2017
6	Find the stability of the system for the characteristic equation given by:	4	KTU Dec 2017
6	Write any four frequency domain specifications	7	KTU Dec 2017
7	A positional control system with velocity feedback is shown in figure .What is the response c(t) to the unit step input. Given that $\zeta =$ 0.5.Write the TF of PID Controller		

8	State initial and final value theorem for Z transform	5	KTU DEC 2018
9	Derive the expression for pulse transfer function of a zero order hold system	7	KTU DEC 2018
10	Determine the state transition matrix of A = $\begin{bmatrix} 0 & 1 \\ 0 & -2 \end{bmatrix}$	8	KTU DEC 2018

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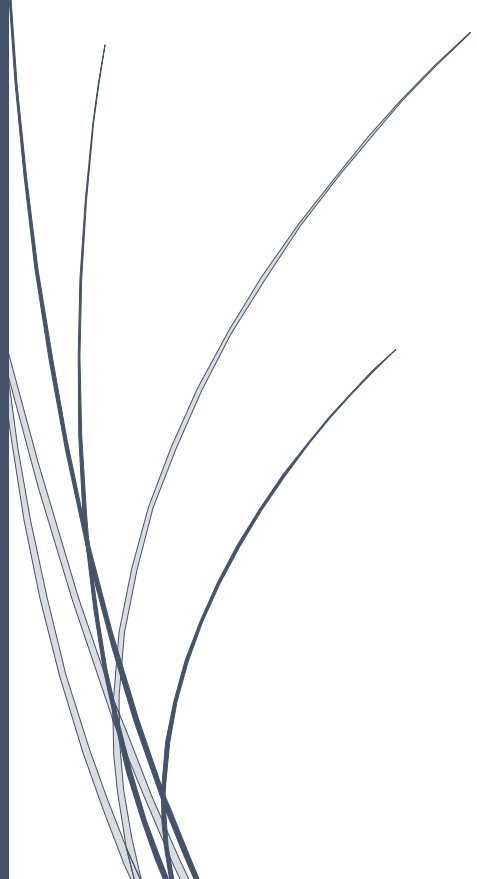
EC 463 SPEECH AND AUDIO SIGNAL PROCESSING

Faculty – Mr. Dawn Sivan



EC463 Speech and Audio Signal Processing

QUESTION BANK

MODULE 1

1. Explain the manner of articulation. (4)
2. Explain the anatomy and physiology of larynx and vocal folds. (5)
3. Explain coarticulation. (5)
4. Explain short-time autocorrelation function and its use in speech analysis. (4)
5. Write notes on short-time average energy and zero-crossing rate. (5)
6. Explain the parametric representation of speech signals. (5)
7. Draw and explain the acoustic model of speech production. (4)
8. Coarticulation is important in speech processing". Justify this statement. (5)
9. Derive the system response of an AR LPC Model. (5)
10. Derive the expression for autocorrelation matrix in linear prediction analysis of speech signals. (5)

MODULE 2

1. Explain cepstral analysis. How the source and the system information are separated using ceptral analysis? (5)
2. Explain the sinusoidal analysis/synthesis of speech signal. (7)
3. What are the different techniques used for speaker recognition? (7)
4. What is spectrogram? Two speech signals $s_1(t)$ and $s_2(t)$ represent a pure male voice and a pure female voice respectively. How is spectrogram useful to distinguish these speech signals? (5)
5. What is the use of windowing in speech analysis? (4)
6. Define a rectangular window. Why is a rectangular window not preferred in speech processing? (5)
7. What is meant by critical band? Calculate the start and end frequencies of the 4th bark. (5)
8. How does the variability in speech signals affect human user and a machine? (7)
9. Suppose uniform filter bank analysis is used to extract the parameters of a speech segment. If the bandwidth of each filter is 100 Hz and speech signal is recorded with sampling frequency 12 kHz, determine the required number of filters to cover the entire spectrum of the speech segment. (2)
10. Differentiate between narrowband and wideband spectrograms. (4)
11. With the help of a block diagram, explain how a Text-to-speech system is implemented. (6)
12. Distinguish between Bark scale and Mel scale. (4)

MODULE 3

1. What are the different measures used to evaluate speech quality? (4)
2. Explain various speech enhancement techniques. (5)
3. Explain in detail about the filtering and adaptive noise cancellation in speech enhancement. (7)
4. What are the necessities of coding in speech processing? (4)
5. An analog sinusoidal signal with V_{pp} = 12V is to be converted into binary code. What is the type of modulation to be used? Explain the steps. (5)
6. Define speech enhancement. Illustrate its necessity using a block diagram approach. (5)
7. Explain how sub-band coding is performed in speech coding. (6)
8. Explain the issues faced in language identification and voice transmission over the internet. (6)

MODULE 4

1. What are the perceptually important features of speech signals? Explain. (4)
2. With the help of a neat diagram, explain the anatomy and physiology of outer ear, middle ear and inner ear. (5)
3. Explain the consonant perception. (5)
4. How does the human ear respond to a fricative just after a vowel? (4)
5. How is the voiced class of obstruents being processed by the ear? (5)
6. Draw the structure of human ear. (5)
7. Distinguish between Simultaneous Masking and Temporal Masking in audio signals. (5)

MODULE 5

1. With the help of a block diagram, explain in detail about backward compatible encoding and decoding of MPEG2. (5)
2. With the help of a block diagram, explain in detail about layer 3 encoding and decoding of MPEG1. (5)
3. What are the methods of Compression amplification in hearing aids? (7)
4. Write short notes on Redundancy removal and Perceptual irrelevancy removal. (9)
5. Explain the concept of pre-echo and give any two models to suppress it. (9)
6. Write in detail about MDCT and its properties. (6)

MODULE 6

1. Explain hidden Markov model. (7)
2. Write notes on Psychoacoustic models. (6)
3 Explain spatial audio coding and rendering. (6)
4 Distinguish between mono, stereo and multi-channel audio (surround sound). (6)
5 Explain an objective method for analyzing audio quality (or) Explain PEAQ method of audio quality analysis. (7)
6 Explain the MUSHRA method (subjective method) for audio quality analysis. (7)