GOVERNMENT ENGINEERING COLLEGE
KATPUR, PATAN

Mid-Term Exam
April 2013

Question Bank

SEMESTER 6th

Electronics & Communication

Hardik

Digital Communication (161001)	
1	Prove that entropy is maximum for equiprobable events.
2	Define: (1)Bandwidth (2)Channel capacity (3)Randomness (4)Coding (5)Redundancy
3	Find the channel capacity of discreet memoryless channel.
4	Find the channel capacity of AWGN channel.
5	Find the channel capacity of BSC.
6	Explain the practical Communication system in light of Shannon's Equation.
7	A zero-memory source emits six messages with probabilities 0.3,0.25,0.15,0.12,0.1 and 0.08. Find the 4-ary (quaternary) Huffman code. Determine its average word lenth, the efficiency and the redundancy.
8	A zero-memory source emits messages m1 and m2 with probabilities 0.6 and 0.4, respectively. Find the optimum (Huffman) binary code for this source as well as for its second and third order extensions. Determine the code efficiencies in each case.
9	Define: 1. Independent events 2. Marginal Probability 3. Sample Space 4. Probability 5. Entropy 5. Conditional probability
10	Two dice are thrown; find out probability that sum of numbers showing on two dice is 5.
11	In PCM, regenerative repeaters are used to detect pulses (before they are lost in noise) and retransmit new, clean pulses. This combats the accumulation of noise and pulse distortion. A certain PCM channel consists of n identical links in tandem. The pulses are detected at the end of each link and clean new pulses are transmitted over the next link. If Pe is the probability of error in detecting a pulse over any one link, show the PE , the probability of error in detecting a pulse over the entire channel (over the n links in tandem), is PE ~ n Pe , nPe << 1
12	Two dice are tossed. One die is regular and the other is biased with probabilities: P(1)=P(6) =1/6, P(3)=P(5) =1/3, P(2)=P(5) = 0 Determine the probabilities of obtaining a sum: (a) 4; (b) 5.
13	Define and explain CDF & PDF.
14	Derive Rayleigh density from two independent Gaussian RVs.
15	Discuss Central limit theorem.
16	Discuss chebyshev inequality.
17	Define following term. (1)Mean (2)Variance (3)nth Moment (4)Deterministic signal (5)Random signal
18	Define and explain Auto correlation.
19	Define and explain correlation.
20	Short note on ASK, FSK, PSK modulation techniques.
21	Find mean, variance and mean square of RV with Gaussian PDF.
22	Distinguish ASK,FSK and PSK modulation techniques.

Audio Video System	
1	Justice the choice of 625 lines for TV transmission. Why the total number of lines kept odd in all television systems. Explain briefly interlaced scanning with necessary waveforms.
2	Sketch the details of horizontal blanking and sync pulses. label on it (i) front porch, (ii) horizontal sync pulse
3	Describe briefly co-channel interference adjacent channel interference and ghost Interference effects.
4	How that a total channel bandwidth of 7 MHz is necessary for successful transmission of both picture and sound signals in the 625 line TV system. Sketch frequency distribution of the channel and mark the location of picture and sound signal carrier frequencies. Why is the sound carrier located 5.5 MHz away from the picture carrier?
5	Draw and explain the working of picture tube?
6	Draw and explain the working of monochrome vidicon camera tube?
7	Draw and explain the block diagram of monochrome TV transmitter.
8	Draw and explain the block diagram of monochrome TV receiver.
9	Draw and explain the block diagram of colour TV transmitter.
10	Draw and explain the block diagram of colour TV receiver.
11	What is flicker? how we can reduce it?
12	Draw and explain the colour picture signal transmission.
13	Draw and explain the horizontal and vertical sync pulse.
14	What is aspect ratio? Explain the persistence of vision.
15	Explain the working principle of moving coil microphone with the help of neat sketch. Write its characteristics and applications.
16	(i) Describe the meaning of Luminance, Hue and Saturation as applied to colour picture. (ii) What do you understand by compatibility between monochrome and colour TV systems and how is this achieved. Why (G-Y) is not chosen for transmission?
17	Write characteristics of a good loudspeaker. Explain working principle of horn type loud speaker.
18	Explain why RGB matrixing is preferred in present day colour receivers? Describe with suitable diagram how R, G and B video signals are obtained from U and V signals.
19	Explain following terms with reference to sound: (1) Timbre (2) Pitch (3) Threshold of hearing (4) Overtones (5) Inverse square law.
20	Explain directivity of a microphone. Draw Omnidirectional, Bidirectional, ardioid, Supercardiod and Hypercardiod pattern specify their applications.
21	With the help of a neat sketch explain principle, construction and working of a Permanent Magnet Moving Coil loud speaker.
22	Explain colour difference signals.
23	What is luminance signal? Why green colour is not transmitted during colour signal transmission.
24	Explain the working process of Cochlea.
25	Explain mental process.
26	Explain the PA System.
27	Design the PA system for Football stadium.
28	Explain the cross over network.
29	Explain the characteristics of microphone.
30	Explain the root means square measurement.

Antenna and Wave Propagation	
1	Explain Antenna Field Zones.
2	Explain the Principle of Pattern Multiplication.
3	Obtain expression for the resultant field due to two isotropic point sources placed at a distance‘d’ and fed with the same amplitude of current and phase.
4	Explain Radiation Resistance of Loop Antenna.
5	Explain Radio Communication Link with Transmitting Antenna and a Receiving Antenna.
6	Explain Broad-side array and End-Fire array.
7	Define and discuss the following parameter / term with help of necessary formula: Radiation patterns.
8	Explain isotropic radiator.
9	What is physical significance of antenna synthesis? Explain the Dolph- Tchebysheff Distribution for linear arrays.
10	Obtain expression for the resultant field due to two isotropic point sources placed at a distance‘d’ and fed with the same amplitude of current but opposite phase.
11	Obtain expression for the resultant field due to two isotropic point sources placed at a distance‘d’ and fed with the same amplitude of currents but with a phase of ‘α’.
12	Explain Radian, steradian and beam solid angle.
13	Explain Binomial array with examples.
14	Explain Radiation intensity.
15	Derive the relation between Directivity and Beam Area.
16	Explain Directivity and Resolution.
17	Explain Antenna Beam efficiency.
18	Explain Half-Power Beam width and First null beam width.
19	Explain effective height of an Antenna.
20	Derive effective aperture and directivity of a short dipole antenna.
21	Derive friis transmission formula.
22	Comparison between an antenna & transmission line.

VLSI Technology and Design	
1	Explain the difference between Full custom and semi custom design style.
2	Explain VLSI design flow in three domains(y-chart).
3	Explain FPGA in detail.
4	Compare Standard cell based design and Full custom design.
5	Explain different IC package types in brief.
6	Explain following term: (a) Testability, (b) Yield, (c) Reliability, (d) Time to market.
7	Explain fabrication steps for NMOS transistor.
8	Explain LOCOS isolation techniques.
9	Explain layout design rules.
10	Explain energy band diagram of MOS system in accumulation, depletion mode and inversion mode.
11	Derive the equation of threshold voltage.
12	Explain gradual channel approximation and derive drain current equation for linear region and in saturation.
13	What is scaling? What is requirement of scaling? Explain full scaling.
14	Explain substrate bias effect.
15	Explain the operation MOSFETs in three different regions.
16	Consider a MOS system with the following parameters: t_{ox} = 200 Å, ϕ_{GC} = -0.85 V, N_A = 2 x 1015 cm^{-3}, Q_{ox} = q x 2 x 1011 C/cm^2 Determine the threshold voltage V under zero bias at room temperature. Note that $\varepsilon_{ox} = 3.97\varepsilon_0$ and $\varepsilon_{si} = 11.7\varepsilon_0$.
17	Explain the band diagram of N-type and P-type semiconductor.

OC	
1	Briefly describe the block diagram of Optical Communication Systems and Mention the applications of optical communication.
2	Give the advantages and disadvantages of optical communication over conventional communication.
3	Define: 1. Acceptance angle & Acceptance cone. 2. Optical bandwidth. 3. Critical angle. 4. Numerical Aperture. 5. Refractive index 6. refractive index difference (Δ) 7. Normalized frequency 8. Cut-off wavelength 9. MFD 10. Polarization. 11. Intermodal dispersion
4	Compare: 1. Step and Graded index Fibers. 2. Single mode & Multimode Fiber. 3. Skew rays and meridional rays.
5	Using simple ray theory, describe the mechanism for the transmission of light within an optical fiber and show how acceptance angle is related to the fiber numerical aperture.
6	Explain total internal reflection and give which is the conditions for total internal reflection?
7	Mode of fiber and A mode remains guided as long as propagation factor p satisfies the condition $n_2k< p< n_1k$.
8	Types of fiber
9	Explain briefly: Variation of refractive index as a function of doping concentration stating the dopants added to silica
10	Give the requirement for fiber material and explain in brief glass fiber and plastic fiber.
11	Explain fiber fabrication techniques: (a) OVPO, (b) VPAD, (c) MCVD, (d) PCVD, (e) Double crucible method.

EXAMPLES:	
1	A step index fiber in air has a numerical aperture of 0.16, a core refractive index of 1.45 and a core diameter of 60 µm. Calculate refractive index of cladding, relative refractive index difference (Δ) and acceptance angle. Determine the normalized frequency for the fiber when light at a wavelength of 0.9 µm is transmitted. Further, estimate the number of guided modes propagating in the fiber.
2	A fiber with n_1=1.5 and n_2=1.47, find acceptance angle, N_A ,critical angle and Δ.
3	A multimode step index fiber with a core diameter of 80µm and a relative index difference of 1.5% is operating at a wavelength of 0.85 µm. If the core refractive index is 1.48 calculate the normalized frequency for the fiber and the number of guided modes.
4	A multimode step index fiber has a refractive index difference of 1% and a core refractive index of 1.5.The number of modes propagating at a wavelength of 1.3µm is 1600.Calculate the acceptance angle, numerical aperture and the diameter of the fiber core.
5	The refractive index of the core of step index fiber is 1.46 and the relative refractive index difference between core and cladding of the fiber is 2%. Estimate (1) Numerical Aperture (2) Critical angle at the core cladding interface within the fiber.
6	A multimode step index fiber with relative refractive index difference 1.5% and core refractive index 1.48 is to use for single mode operation. If the operating wavelength is 0.85µm calculate the maximum core diameter.
7	A GRIN fiber with parabolic refractive index profile core has a refractive index at core axis of 1.5 and relative index difference at 1%.Calculate maximum possible core diameter that allows single mode operation at lambda =1.3µm.
8	A step index fiber having M=1.47, a=4.3, Δ=0.20%, find out cut off wave length.