INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

TUTORIAL QUESTION BANK

Course Name	:	WIRELESS COMMUNICATIONS AND NETWORKS
Course Code	:	A80454-R15
Class	:	IV - B. Tech
Branch	:	ECE
Year	:	2018 – 2019
Course Coordinator	:	Mr. MD Khadir, Assistant. Professor, ECE Dept.
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OBJECTIVE

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

UNIT-I THE CELLULAR CONCEPT-SYSTEM DESIGN FUNDAMENTALS			
PART A:(Short Answer Questions)			
S. No	**Questions**	**Blooms Taxonomy Level**	**Course Outcome**
1	Define frequency reuse?	Understand	1
2	What is known as foot print?	Understand	1
3	Define frequency planning?	Remember	1
4	What is cellular frequency reuse concept?	Remember	2
5	Define channel assessment strategies?	Understand	2
6	Define borrowing strategies?	Remember	2
7	Demonstrate handoff strategies?	Understand	2
8	What is prioritizing handoffs?	Remember	2
9	Define cell dragging?	Understand	2
10	Distinguish between hard handoff and soft handoff?	Understand	2
11	Define co-channel interference?	Remember	2
12	What is adjacent channel interference?	Understand	2
13	Define setup time?	Remember	2
14	Define holding time?	Remember	1
15	Define grade of service?	Remember	1
16	What is meant by request rate and load?	Understand	1
17	What is trunking efficiency?	Remember	2
18	Define cell splitting?	Understand	2

19	Define sectoring?	Remember	2
20	What is micro cell zone?	Remember	2
21	Give the relation between received carrier power and distance measured from Transmitter to the receiver end?	Understand	2
22	Define fading effect?	Remember	2
23	What is known as Rayleigh fading?	Understand	1
24	Define co-channel interference.	Remember	1
25	Mention the co-channel interference reduction factor.	Remember	1
26	What is meant by frequency reuse distance?	Understand	1
27	What are advantages of frequency reuse?	Remember	1
29	Define micro cells.	Remember	2
30	What is meant by macro cell?	Understand	2
31	What is the value of co-channel interference reduction factor in a 7-cell reuse Pattern?	Understand	2
32	What is the use of cell splitting?	Remember	2
33	What is the demerit of cell splitting?	Remember	2
34	Explain any two components of cellular system.	Understand	2

PART B:(Long Answer Questions)

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1	Mention the significance of frequency reuse in cellular networks. Explain about frequency reuse strategies?	Understand	1
2	Distinguish between fixed channel assignment and dynamic channel assignment in cellular networks?	Understand	2
3	Describe the concept of frequency reuse. Derive the equation for the frequency reuse ratio?	Understand	2
4	Consider a cellular system in which the total available voice channels to handle the traffic are 1200.The area of each cell is 9km^2 and the total coverage area of the system is 3600km^2.Determine the system capacity if the cluster sizeis 4.	Remember	1
5	Illustrate the handoff scenario at cell boundary with a neat diagram?	Remember	2
6	Define signal to interference ratio. Derive the equation of signal to interference ratio for a mobile receiver?	Understand	2
7	Illustrate the cell splitting with in a 3km by 3km square centered around base station A with a neat diagram?	Understand	2
8	Define D, Dz, R, Rz for a microcell architecture with N=7?	Understand	1
9	What is cell-splitting? Explain its types in detail.	Remember	1
10	Explain significance of Omni-directional antenna system.	Understand	2

PART C: (Analytical Questions)

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1	Consider maximum number of calls in one hour in one cell is 3500 and an average calling time't' is 1.76 minutes. Calculate the offered load in the cell.	Remember	1
2	Consider a metropolitan area of 1100 square km is to be covered by cells with cell radius of 2 km. Calculate the number of cells that would be needed	Remember	1
3	Assume a cellular system operates with traffic of 2500 Erlangs. If each user in the system uses phone for 3 minutes of busiest hour on an average case, then find the number of users which can be accommodated under even distribution	Understand	1
4	A receiver equivalent noise figure value is 3 db. Find its equivalent noise temperature.	Understand	2

5	Consider a cellular system which consists of 34 cells with the cell radius as 1.4 km. a total frequency bandwidth is capable of supporting 343 traffic channels. Find what geographical area in km can be covered and the number of channels available per call.[Assume N=7 reuse cellular pattern].	Understand	2
6	For a seven cell reuse pattern find the reuse factor if the minimum distance between centers of co-channel-cells is 18 km. Radius of cell is 3 km and the distance between adjacent cells in the seven cell pattern is 6 km.	Remember	2
7	Assume a cellular phone transmitter has deviation of 11 kHz frequency. If the transmitter operates at a maximum deviation with voice frequencies 500 Hz and 3500 Hz, calculate their modulation index value.	Understand	2
8	The coverage area of a cellular system is 2000sq km with each cell having a radii of 5sq km,and there are a total of 1000 radio channels available for handling the traffic, calculate the system capacity for 7 cell reuse.	Understand	1

UNIT –II
MOBILE RADIO PROPOGATION

PART A(Short Answer Questions)

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1	Define free space propagation model?	Remember	3
2	Relation between gain of an antenna to its effective aperture (A_e)?	Understand	3
3	Define effective isotropic radiated power(EIRP)	Understand	3
4	Define path loss?	Understand	3
5	Define reflection and diffraction?	Remember	3
6	Define Brewster angle?	Remember	3
7	Write the equation for long distance path loss model?	Understand	3
8	Write short notes on ray tracing?	Remember	4
9	Define scattering?	Understand	4
10	Classification of indoor propagation model?	Remember	4
11	What are the basic propagation mechanisms?	Understand	4
12	Classification of outdoor propagation model?	Understand	4

PART B (Long Answer Questions)

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1	Explain how the two-ray model is used when a single ground reflection dominates the multipath effect?	Remember	3
2	How the received signal strength is predicted using the free space propagation model? Explain?	Remember	3
3	Classify the outdoor propagation model? Discuss in detail?	Understand	3
4	Classify the indoor propagation model? Discuss in detail?	Understand	4
5	Explain about Fresnel zone geometry model?	Remember	4
6	Explain the advantages and disadvantages of tw ay ground reflection model in the analysis f the path loss.	Understand	4
7	Illustration of knife-edge diffraction geometry model?	Understand	4
8	Show that the Brewster angle is given by θ_i where $\sin\theta_i = \sqrt{\varepsilon^2_r} - \varepsilon_r / \sqrt{\varepsilon^2_r} - 1$	Understand	4
9	Explain the dependence of surface roughness on the frequency and angle of incidence.	Remember	4
10	State and Explain in detail about attenuation factor model ?	Remember	4
11	Explain in detail about effective isotropic radiated power(EIRP)?	Understand	3

PART C: (Analytical Questions)

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1	Find the fraunhoher distance for an antenna with maximum dimension of 1m and operating frequency of 900MHz.If antenna have unity gain. Calculate the path loss?	Remember	3
2	If a transmitter produce 50W of power express the transmit power in units of dBm ,dBW.If 50W is applied to a unity gain antenna with 900MHz carrier frequency ,find the receiver power in dBm at a free space distance of 100m from the antenna. What is P_r(10KM)?assume unity gain receiver antenna.	Remember	3
3	A mobile is located at 5KM away from a base station and uses a vertical $\lambda/4$ monopole antenna with a gain of 2.55dB to receive cellular radio signals. The E field at 1KM from the transmitter is measured to be 10^{-3}V/m.The carrier frequency used for the system is 900MHz.Find the received power at the mobile using the two-ray ground reflection model. Assuming the height of the transmitting antenna is 50m and the receiving antenna is 1.5m above ground.	Understand	4

UNIT-III
MOBILE RADIO PROPOGATION

PART A (Short Answer Questions)

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1	Define small scale multipath propagation?	Remember	5
2	Define multipath?	Remember	5
3	Relationship between bandwidth and received power?	Understand	5
4	What are the techniques classified for the small scale multipath measurements?	Remember	5
5	What are the parameters of time dispersion?	Understand	5
6	Define Doppler spread and coherence time?	Understand	5
7	Define coherence bandwidth?	Remember	5
8	Write any two differences between frequency selective fading and flat fading?	Remember	5
9	Write the parameters of time dispersion parameters?	Remember	5
10	Write the factors influencing of small scale fading?	Understand	5
11	Draw the block diagram of direct RF channel impulse response measurement System?	Understand	5
12	Draw the block diagram of direct spread spectrum channel impulse response measurement System?	Understand	5
13	What are the parameters of mobile multipath channels?	Understand	5
14	State Spread Spectrum Sliding Correlator Channel Sounding?	Understand	5
15	Define Frequency Domain Channels Sounding?	Understand	5
16	Define mean excess delay?	Understand	5
17	Define rms delay spread?	Understand	5
18	Write multipath shape factors for small scale fading?	Understand	6
19	Define received power?	Remember	6
20	Define received envelope?	Understand	6
21	Differences between Rayleigh distribution and Ricean distribution?	Understand	6
22	What are the types of small scale fading?	Understand	6
23	Mention average fade duration?	Understand	6
24	Define frequency selective fading?	Remember	6
25	State fast fading?	Understand	6

26	State slow fading?	Understand	6
27	Define Rayleigh fading distribution?	Remember	6
28	What is two Rayleigh fading model?	Understand	6
29	What is SIRCIM?	Understand	6
30	What is SMRCIM?	Remember	6
31	What is multipath share factor?	Remember	6
32	Define angular spread?	Understand	6
33	What is angular constriction?	Understand	6

PART B (Long Answer Questions)

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1	Define small scale fading .Write the factors influencing fading?	Understand	5
2	Explain about impulse response model of a multipath channel?	Understand	5
3	Classification of the small scale multipath measurements and explain in detail about direct RF pulse system measurement with a block diagram?	Understand	5
4	Explain in detail about spread spectrum channel impulse response measurement system with a neat block diagram?	Understand	5
5	Explain in detail about frequency domain channel impulse response measurement system with a neat block diagram?	Understand	5
6	What are the parameters of mobile multipath channels? Write brief notes of each parameter of mobile multipath channels?	Understand	6
7	Discuss about small scale fading based on multipath delay spread in detail?	Understand	6
8	Discuss about small scale fading based on Doppler spread in detail?	Understand	6
9	Simulation of clerk and Gans fading model using quadrature amplitude modulation with RF Doppler filter and baseband Doppler filter with neat diagram?	Understand	6
10	Explain about two-ray Rayleigh fading model?	Understand	6
11	Explain about the multipath shape factors for small scale fading in detail?	Understand	6

PART C: (Analytical Questions)

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1	For a Rayleigh fading signal find a) Number of zero level crossings b) The average fade duration for threshold levels $\rho=0.1$ and $\rho=1$ when Doppler frequency is 20Hz.	Remember	5
2	For a Rayleigh fading signal find the average fade duration for threshold levels $\rho=0.1$ and $\rho=1$ when Doppler frequency is 30Hz.	Remember	6

UNIT-IV
EQUALIZATION AND DIVERSITY

PART A(Short Answer Questions)

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1	Define diversity?	Understand	7
2	Define equalization?	Remember	7
3	What are the different receiver diversity combining techniques?	Understand	7
4	What is prediction error?	Remember	7
5	Classification of equalizers in communication receiver?	Remember	7
6	Define the types of linear equalizers?	Understand	7
7	Define the types of nonlinear equalizers?	Remember	7
8	What is mean by rate of convergence?	Remember	8

9	What are the factors present in algorithms for adaptive equalization?	Understand	8
10	Define zero forcing algorithm?	Remember	8
11	Write short notes on least mean square algorithm?	Remember	8
12	Define polarization diversity?	Understand	8
13	What are the classifications of space diversity reception method?	Understand	8
14	Difference between frequency diversity and time diversity?	Remember	8
15	Define rake receiver?	Understand	8

PART B(Long Answer Questions)

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1	What are the different receiver diversity combining techniques? Explain in detail.	Understand	7
2	Explain the algorithms for adaptive equalization ?	Understand	7
3	Explain fundamental concept of equalization?	Understand	7
4	Explain maximum likelihood sequence estimation(mlsc) equalizer?	Remember	7
5	Explain a simplified communications system using an adaptive equalizer at the receiver with neat diagram?	Understand	7
6	Discuss in detail about the categories of the practical space diversity considerations?	Understand	7
7	Explain the structure of linear equalizer techniques in detail?	Understand	8
8	Explain the structure of nonlinear equalizer techniques in detail?	Understand	8
9	Derive the equation of maximul ratio combining improvement?	Remember	8
10	Derive the equation of selection diversity improvement?	Remember	8
11	Write the short notes on theoretical model for polarization diversity?	Understand	8
12	Draw the neat block diagram of an M branch rake receiver implementation?	Understand	8

PART C: (Analytical Questions)

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1	Derive the equation of maximal ratio combining improvement?	Remember	7
2	Derive the equation of selection diversity improvement?	Remember	7

UNIT-V
WIRELESS NETWORKS

PART A(Short Answer Questions)

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1	List out the wireless topologies?	Remember	9
2	Define hyper LAN?	Understand	9
3	Write the advantages of wireless LAN?	Understand	9
4	Write the disadvantages of wireless LAN?	Remember	9
5	State the enhancement of IEEE 802.16?	Remember	10
6	Demonstrate about wireless LAN?	Understand	9
7	Demonstrate about wide LAN?	Remember	9
8	What is IEEE 802.11a standard?	Understand	10
9	What is IEEE 802.11b standard?	Understand	10
10	What is IEEE 802.11g standard?	Remember	10
11	What is IEEE 802.11n standard?	Understand	10
12	Define PAN?	Understand	10
13	What are the advantages of PAN?	Remember	10
14	Define WLL?	Understand	10

PART B (Long Answer Questions)

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1.	What are the advantages and disadvantages of wireless local area networks?	Understand	9

S. No	Questions	Blooms Taxonomy Level	Course Outcome
2.	Explain, when does a WLAN become a personal area network(PAN)?	Understand	10
3.	Determine the characteristics of HIPER LAN?	Understand	9
4.	What are the different topologies of wireless LAN? Explain in detail.	Understand	9
5.	Comparison between the IEEE 802.11 a,b,g and n standards?	Remember	10
6.	Explain in detail about wireless local loop? List out the advantages and disadvantages of the wireless loop?	Understand	10
7.	Discuss in detail about IEEE 802.11 medium access control?	Remember	10
8.	State and explain about IEEE 802.11 a standard?Detemine the properties of IEEE 802.11 a.	Remember	10
9.	State and explain about IEEE 802.11 b standard?Detemine the properties of IEEE 802.11 b.	Remember	10
10.	State and explain about IEEE 802.11 g standard?Detemine the properties of IEEE 802.11 g.	Remember	10

PART C: (Analytical Questions)

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1	Discuss in detail about the enhancement of IEEE 802.16 standards?	Remember	10
2	Explain in detail about the performance of integration of the exisiting wieless networks.	Remember	10

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