INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

ASSIGNMENT QUESTIONS

Course Name	:	SATELLITE COMMUNICATIONS
Course Code	:	A80452-R15
Class	:	IV - B. Tech II sem
Branch	:	Electronics and Communication Engineering
Year	:	2018 – 2019
Course Coordinator		Mrs. G.Bhavana,Assistant Professor,ECE
Course Faculty	:	Mrs. G.Bhavana,Assistant Professor,ECE Ms. U.Dhanalkshmi ,Assistant Professor,ECE

OBJECTIVES

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.

ASSIGNMENT I			
UNIT-I COMMUNICATION SATELLITE			
S. No	Questions	Blooms Taxonomy Level	Course Outcome
1.	Explain a brief account of i. Theory and application of geocentric equatorial coordinate systems. ii. Orbital elements and orbital plane	Understand	1
2.	Discuss the elements of satellite communication systems? Explain each with a suitable block diagram?	Understand	1
3.	Explain the basic differences between an active and passive satellite. Whether a passive satellite can be used for communication? If yes explain	Understand	1
4.	Explain the historical background on satellite communication?	Remember	1
5.	Illustrate the advantages of digital satellite communication over its analog satellite communication?	Understand	1
6.	Describe different frequency bands which are allocated for satellite communication and explain the uses of these frequencies?	Understand	1
7.	Illustrate the effect of eclipse on orbital motion of satellite in brief?	Remember	2
8.	Describe in brief about Azimuth and Elevation angles in satellite	Remember	2
9.	Explain the coverage angle and slant range of satellite communication?	Understand	2
10.	Discuss the orbital aspects, which are of importance in synchronous satellite communications. Explain these aspects in brief?	Understand	2
11	Summarize the maximum and minimum range in kilometer from an earth station to geo-Synchronous satellite. To what round trip propagation times do these correspond?	Understand	1

12	A satellite is in 322-km high circular orbit Estimate. i. Orbital angular velocity. ii. Orbital period. iii. Orbital linear velocity.	Understand	2
13	Explain how Kepler's and Newton's laws are useful to describe the orbit. **A)** A satellite is moving in a highly eccentric Molniya orbit having the farthest and the closest points as 3500km and 500km and 500km respectively from earth surface. Determine the orbital time period time period time period and the velocity at apogee and perigee points. (Assume earth's radius = 6360km). **B)** The semi-major axis and the semi-minor axis of an elliptical satellite orbit are 20,000km and 16,000km respectively. Determine the apogee and	Understand	2
14	A satellite is orbiting in the equatorial plane with a period from perigee to perigee of 12hours. Given that the eccentricity is 0.002, calculate the semi-major axis. The earth's equatorial radius is 6378.1414 Km.	Remember	2
15	Explain the interpretation of Kepler's laws. Satellite is orbiting in a geosynchronous orbit of radius 42500km. find the velocity and time of orbit. What will be the change in velocity if the radius reduces to 36000km.if go=398600.5Km3s2.	Remember	2
16	If a satellite has an orbiting time of 23 hrs 56 min. calculate orbiting distance. Assume suitable data if required. A satellite is orbiting round the earth at 4212km. The earth station is looking at this satellite at an elevation angle of 35degree. Calculate slant range. Make a suitable assumption.	Understand	1

UNIT-II SATELLITE SUB-SYSTEMS			
S. No	**Questions**	**Blooms Taxonomy Level**	**Course Outcome**
1.	Explain the different types of noise to be considered in the design of satellite communication system? Explain the calculation of combined uplink and downlink C/N ratio?	Understand	4
2.	Discuss with a neat diagram the Anik-E C band transponder. Explain the attitude control of a satellite with necessary diagrams.	Understand	4
3.	State how does the system noise temperature affect the performance? Derive the expression for overall system noise temperature at the receiving earth station?	Remember	3
4.	Estimate link power budget equation and explain about the downlink and uplink rain fade margin.	Remember	3
5.	Formulate general link equation. Find out an expression for C/N and G/T ratios. Explain the importance of these ratios on satellite link design?	Remember	4
6.	Explain how the uplink design is different from downlink design? Why design of downlink is more critical than of uplink? In what conditions a complete satellite link became downlink limited?	Remember	5
7.	Explain the functions and characteristics of satellites and various sub-system of satellites?	Understand	4
8.	Discuss the attitude and orbit control subsystems? Explain how they perform their functions?	Understand	4
9.	Explain telemetry, tracking and command (TT&C) subsystem of a satellite With the help of block diagram?	Remember	5
10.	Discuss reliability and redundancy? Explain how reliability increases through redundancy?	Understand	4
11.	Explain satellite stabilization? Explain the importance of stabilization. Make a comparative study between spin stabilization and three axes body stabilization?	Understand	4
12	A satellite TV signals occupies the full transponder bandwidth of 36 MHz, and it must provide a C/N ratio of 22 dB the destination losses are 200 dB and the destination earth station G/T ratio is 31dB/K, Calculate the satellite required.	Remember	4

S. No	Questions	Blooms Taxonomy Level	Course Outcome
13	Discuss about near geostationary orbits Determine the limits of visibility for an earth station situated at mean sea level, at latitude 48.42 degree north and longitude 89.26 degree west. Assume a minimum angle of elevation of 5.9 degree. Discuss about sun transit outage?	Understand	4
14	Consider the receiver side of an earth station. The antenna gain is 65 dB and it noise contribution in 60 K. The wave guide Ions is 0.5 dB. Sketch the equivalent noise temperature of LNA assuming that the noise contribution by the down converter is negligible and earth station G/T is 40 dB. K. (To=300K).	Understand	4
15	a) Explain the following: input back off, output back off, earth station HPA and combined uplink and downlink. C/N ratio. For a satellite circuit the individual link carrier-to-noise spectral density ratios are: uplink 100 dB Hz; Downlink: 87 dB Hz. Calculate the combined.	Remember	5
16	State the limits of visibility for an earth station situated at mean sea level, at latitude 48.42 degrees north and longitude 89.26 degrees West. Assume a minimum angle of elevation of 5 degrees?	Remember	5

UNIT-III
PROPAGATION EFFECTS

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1	Classify the difference between the pre-assignment and demand assignment multiple access systems. Also make a comparative study of advantages and disadvantages between them?	Understand	5
2	Explain the DA-TDMA brust structure. Make a comparative study between DA-TDMA and DA FDMA system?	Remember	5
3	Develop various techniques for improving throughputs of ALOHA system/Discuss about reservation ALOHA system?	Remember	5
4	Explain pre assigned and demand assigned TDMA systems and Discuss the operation of SPADE communication system?	Understand	5
5	Explain the principle behind spectrum spreading and dispreading and how this issued to minimize interference in a CDMA system. Also determine the throughput efficiency of the system?	Understand	5
6	With the help of structure define the TDMA super frame and explain how if differs from a simple TDMA frame?	Remember	5
7	Define the C/N ratio relationship of FDM-FM-FDMA demodulator circuit and list all the parameters incorporated into the relationship?	Remember	5
8	Compare similarities and differences in the fundamental concepts of direct sequence spread spectrum system verses a frequency hopping spread spectrum system?	Remember	5
ASSIGNMENT II			
9	Explain the concept of Ionosphere Scintillation along with the pattern occurrence of ionospheric Scintillation and low angle fading?	Understand	5
10	Explain trans-ionospheric propagation predictions and corrections? Give the relationship between water vapor pressure and density?	Understand	5
11	Describe attenuation? Explain the several statistical models of attenuation due to rain?	Understand	5
12	Discuss in detail about direct sequence spread spectrum? In a TDMA network the reference burst and the preamble each requires 560 bits and the nominal guard interval between bursts is equivalent to 120 bits. Given that there are eight traffic bursts and one reference burst per frame and the frame length is equivalent to 40800 bits, calculate the frame efficiency?	Understand	5
13	Explain what is meant by asymmetric channels. Describe how asymmetric channels may be incorporated in internet connections via satellites? For a 24 MHz bandwidth transponder and allowing for a roll off factor of 0.2, what is symbol rate?	Remember	5
14	A communication satellite is used for voice signal transmission with a bit rate of 60.8 Kb/s. If the earth station transmit TDMA with an efficiency of 90% and if transmission line bit is 130 Mb/s, Calculate the number of channels?	Remember	5

S. No	Questions	Blooms Taxonomy Level	Course Outcome
15	Explain the concept of RMA? The EIRP of a 240 W transponder is 57 dBW. Calculate the approximate gain of the antenna. Suppose if this transponder is Switched to 120 W. What will be the new EIRP, given the same antenna is used?	Remember	5
16	Explain What is inter-modulation noise? A satellite downlink at 12 GHz operates with a transmit power of 6 W and an antenna gain of 48.2 dB. Calculate the EIRP in dBW.	Understand	5
17	List the earth station parameters affecting the C/N ratio? What is the relationship between EIRP and antenna gain?	Remember	5

UNIT-IV
EARTH STATION TECHNOLOGY

S. No	Questions	Blooms Taxonomy Level	Course Outcome
1	Explain with a block diagram the working of receiver part of earth station?	Understand	7
2	a) Quote a brief account of MPEG compression standards. b) Write a block diagram explain home receiver indoor unit.	Remember	6
3	Explain the objectives, principles and applications of i. Orbcomm. ii. GPS system.	Understand	6
4	a) Discuss in detail about global positioning satellite system. b) Write brief notes on the advantages and disadvantages of using satellite in LEOs, MEOs and GEOs for mobile satellite communications.	Understand	7
5	Explain in detail about TVRO systems and explain how the gain of large antenna can be optimized?	Understand	7
6	Explain with the neat diagram the indoor and outdoor units of DBS home receiver and Discuss the satellite mobile services?	Understand	7
7	Explain what do you mean by the direct broadcast satellite service. How does it differ from the home reception of satellite TV signals in the C-band, which is common place today?	Remember	7
8	Explain with the help of a block diagram; briefly describe the functioning of indoor receiving unit of a satellite TV receiving system intended for home reception?	Understand	7
9	Define frequency co-ordination, co-ordination area and counter? Differentiate small earth station and a large earth station?	Remember	7
10	Explain the power test methods and lower orbit considerations of earth station technology in satellite communications?	Understand	7
11	Explain the concept of GPS receiver and GPS C/A code Accuracy? Explain the location principles of satellite navigation and global Polling systems?	Understand	7
12	Explain all the types of INTELSAT satellite with respect to basic space craft characteristics and the vehicle type?	Understand	7
13	a) For a 24 MHz bandwidth transponder and allowing for a roll off factor of 0.2, what is the symbol rate? b) The EIRP of a 240W transponder is 57dBW. Calculate the approximate gain of the antennas. Suppose if this transponder is switched to 120W. What will be the new EIRP, Given the same antenna is used?	Remember	7
14	Write note on i. Bit rate for digital television. ii. MPEG compression standards.	Understand	6
15	i. Discuss briefly on DAB system. ii. With a neat block diagram explain (lie outdoor unit for an OUS home receiver).	Understand	7

S. No	UNIT-V SATELLITE PACKET COMMUNICATIONS		
	Questions	Blooms Taxonomy Level	Course Outcome
1	Describe what satellite communication protocol used in satellite communication?	Understand	8
2	Differentiate pure ALOHA satellite packet switching with slotted ALOHA packet switching?	Understand	8
3	Discuss in brief the message transmission by FDMA by using MI G/I Queue?	Understand	8
4	Describe in detail about the message transmission by using TDMA technique?	Understand	8
5	Explain the design network channel architecture and transmission of ALOHA net?	Remember	8
6	Discuss in brief about packet reservation multiple access with the help of traffic load?	Understand	8
7	Explain the concept of Dynamic allocation of satellite capacity through packet reservation?	Remember	8
8	Explain packet collision and how it is resolved in pure and slotted ALOHA with the help of tree algorithm?	Remember	8
9	Discuss the Stability analysis for communication of voice terminals with packet reservation multiple access protocol?	Understand	8
10	Discuss the preliminaries in packet communications?	Understand	8
11	Consider a slotted ALOHA system in which a Guard time 125 bits is used between slots to account for satellite movement. The channel bit rate is 56 kbps and the packet length is 25ms.the channel has a bit error probability of p. Calculate the throughput of the channel?	Remember	8
12	Design the channel backlog in packets for a slotted ALOHA satellite channel with an infinite population and at equilibrium. The channel input rate is 0.346,the randomized retransmission interval is 60 packet lengths, and the satellite roundtrip propagation delay is taken to be 12 packet slots. What is the average packet delay in packet slots?	Understand	8
13	A community of N earth stations shares a 64-kbps aloha satellite channel. Each earth station sends out a 1000-bit packet on an average of once every 100s.Caluculate what is the maximum value of N?	Remember	8
14	Design the average packet delay for 50-kbps ALOHA satellite channel operating at a throughput of 8kbps with 1000-bit packets. The average satellite roundtrip delay is 13 packets, and the randomized retransmission interval is 10 packet lengths. If the average user throughput over time is 1 packet/2 min, estimate the number of users the channel support?	Understand	8
15	Digital speech interpolation is used in the TDMA system. Where all the traffic is PCM voice at 64 kbps. Each DSI-TIM in the network accommodates 240 terrestrial channels and interpolates them into 127 satellite channels with one DSI-AC channel at 64 kbps. Estimate how many terrestrial channels can the satellite transponder accommodate?	Understand	8

Prepared by: Mrs. G. Bhavana, Assistant Professor

HOD, ECE