

University of Mumbai

Examinations Summer 2022

Sample Questions-Satellite Communication

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	The period of Satellite around the earth can be computed using:
Option A:	Newton's law of gravitation
Option B:	Kepler's Second law
Option C:	Kepler's Third law
Option D:	Newton's third law
2.	A satellite antenna has a diameter of 3m and transmission frequency of 6 GHz . The 3-dB beam width is
Option A:	0.625 Degree
Option B:	1.25 Degree
Option C:	2.5 Degree
Option D:	5 Degree
3.	In a large earth station where beam width is small tracking is:
Option A:	Not necessary
Option B:	Necessary
Option C:	Not necessary for the GEO satellite
Option D:	Necessary for LEO satellite
4.	Path loss is :
Option A:	Same in uplink and downlink.
Option B:	Low in uplink and high in downlink.
Option C:	High in uplink and low in downlink.
Option D:	Low or high depends upon the propagation condition.
5.	In C band the normal uplink and downlink frequency is-----
Option A:	6GHz-4GHz
Option B:	14GHz-12GHz
Option C:	20GHz-16GHz
Option D:	32GHz-28GHz
6.	Which of the following terms is used to describe the microwave radiation which is present throughout the universe and appears to originate from matter in any form at a finite temperature?
Option A:	Noise factor
Option B:	Antenna loss
Option C:	Sky Noise
Option D:	Noise power spectral density
7.	Having a large Frame size in a TDMA system
Option A:	Increases the frame efficiency.
Option B:	Reduces the frame efficiency.
Option C:	Increases the channel capacity.
Option D:	Increases the buffer size at the earth station.

8.	Random access is suitable for
Option A:	Voice Transmission
Option B:	Data Transmission
Option C:	Video Transmission
Option D:	Transmitting all the above signals
9.	Most VSAT systems operate in the _____, although there are some C-band systems in existence
Option A:	Ka band
Option B:	Ku band
Option C:	L- band
Option D:	C band
10.	Iridium satellites are _____ satellites.
Option A:	GEO
Option B:	MEO
Option C:	LEO
Option D:	Geostationary
11.	In Satellite signals Horizontal polarization means?
Option A:	Electric field is parallel to earths Polar Axis
Option B:	Electric field is perpendicular to earths Polar Axis
Option C:	Electric field is parallel to earths Equatorial plane
Option D:	Electric field is In the boresight direction
12.	Which of the following transponders convert the uplink signal to downlink signal using two mixers
Option A:	Single conversion transponders
Option B:	Dual conversion transponders
Option C:	Regenerative transponders
Option D:	Dual mixer transponder
13.	Orbital position of satellite is governed by
Option A:	Ground station
Option B:	Transponder
Option C:	TT and C
Option D:	Power subsystem
14.	Terrestrial incoming base band signals at earth stations are converted in to-----
Option A:	Microwave carrier
Option B:	IF
Option C:	Base band
Option D:	RF formatted baseband
15.	The low-noise amplification must be provided at the cable input in order to
Option A:	Increase gain
Option B:	Reduce attenuation
Option C:	Maintain Signal to Noise ratio
Option D:	Minimize distortion
16.	The quality of space link is measured in terms of -----ratio
Option A:	C/N

Option B:	S/N
Option C:	G/T
Option D:	EIRP
17.	Power flux density at a distance R meter is the power
Option A:	Transmitted per unit area
Option B:	Received at a distance R
Option C:	Received in unit area at a distance of r meters
Option D:	Received in unit area at a distance of 2R
18.	A receiver for frequency-hopping spread-spectrum would be:
Option A:	a narrowband receiver
Option B:	a wideband receiver
Option C:	a direct-conversion receiver
Option D:	CDMA receiver
19.	DAMA stands for
Option A:	Data accessibility master aerial
Option B:	Digital attenuators microwave antenna
Option C:	Dual accessibility mode antenna
Option D:	Demand assigned multiple access
20.	Most VSAT systems operate in the _____, although there are some C-band systems in existence
Option A:	Ka band
Option B:	Ku band
Option C:	L- band
Option D:	C band
21.	What is the frequency range of Ka-band?
Option A:	8 to 12GHz
Option B:	12 to 18GHz
Option C:	4 to 6GHz
Option D:	27 to 31GHz
22.	_____ is the path traced out on the earth's surface directly below the satellite.
Option A:	Station keeping
Option B:	Zenith
Option C:	Footprint
Option D:	Sub satellite path
23.	The period of Satellite around the earth can be computed using _____
Option A:	Newton's law of gravitation
Option B:	Kepler's Second law
Option C:	Kepler's Third law
Option D:	Newton's third law
24.	At the focus of parabolic reflector, which of the following antenna is used?
Option A:	Yagi Uda
Option B:	Dipole
Option C:	Horn

Option D:	Helical
25.	Which of the following is not applicable for earth station requirements?
Option A:	High gain in the direction of wanted signals
Option B:	Low effective noise temperature for the entire receiving system
Option C:	Maximum variation in performance due to local wind and weather
Option D:	High discrimination between orthogonally polarized signals
	Maximum variation in performance due to local wind and weather
26.	In satellite communication, the Intermediate Frequency (IF) can be chosen as _____ MHz by using a transponder having bandwidth of _____ MHz
Option A:	70, 36
Option B:	36, 70
Option C:	120, 60
Option D:	60, 120
27.	The point where the orbit crosses the equatorial plane going from north to south is called _____.
Option A:	Ascending node
Option B:	Descending node
Option C:	Line of nodes
Option D:	Line of apsides
28.	The inclination of a prograde orbit always lies between _____ and _____.
Option A:	0 degree & 90 degree
Option B:	90 degree & 180 degree
Option C:	180 degree & 270 degree
Option D:	270 degree & 360 degree
29.	Prime focus feed and Cassegrain feed system are examples of _____
Option A:	Balanced Configuration
Option B:	Asymmetric Configuration
Option C:	Axi-Symmetric Configuration
Option D:	Unbalanced Configuration
30.	Which of the following are the two important performance parameters of the Earth Stations?
Option A:	EIRP and G/T of receiver
Option B:	EIRP and modulator and Demodulator technique
Option C:	Frequency band and size of antenna
Option D:	Multiple access technique and size of earth station
31.	In satellite communication, IF can also be chosen as _____ MHz by using a transponder having bandwidth of either _____ MHz or _____ MHz
Option A:	140MHz, 54MHz, 72MHz
Option B:	240MHz, 45MHz, 90MHz
Option C:	170MHz, 55MHz, 85MHz
Option D:	150MHz, 65MHz, 95MHz
32.	Determine apogee and perigee distances. If the difference between apogee and perigee distances in case of an elliptical orbit is 34000km and the major axis of the elliptical orbit is 50000km,
Option A:	50000km, 42000km

Option B:	42000km, 8000km
Option C:	42500km, 8500km
Option D:	50000km, 8500km
33.	A major difference between DBS TV and conventional TV is that in DBS _____ is used, whereas with conventional TV _____ in the form of vestigial single side-band (VSSB) is used.
Option A:	Frequency modulation, amplitude modulation
Option B:	Frequency modulation, digital modulation
Option C:	Phase modulation, amplitude modulation
Option D:	Frequency modulation, phase modulation
34.	Which of the following is not true about LNA?
Option A:	It amplifies a very low-power signal without significantly degrading its signal-to-noise ratio.
Option B:	It is placed near the transmitting antenna.
Option C:	LNA has a low noise figure and a very high gain.
Option D:	Noise figure, Gain and Linearity are important parameters for LNA
35.	The equatorial ellipticity of the earth causes geostationary satellite to drift to one of the two stable points, at
Option A:	45° E & 165 ° W
Option B:	55° E & 125 ° W
Option C:	75° E & 105 ° W
Option D:	85° E & 115 ° W

Option 1

Q2, Q3 and Q4 (20 Marks Each)	Solve any Four out of Six	5 marks each
A	Explain transponder sub-system.	
B	What are the limits of Visibility of satellites? How is it calculated?	
C	Discuss in brief general configuration of an earth station.	
D	Explain the following: a. EIRP and G/T b. Combined Uplink and Downlink C/N ratio	
E	Compare centralized and distributed control of demand assignment.	
F	Explain GPS in detail.	
G	Write the advantages and disadvantages of Satellite Communication	
H	Define different orbital Parameters.	
I	What are Look angles? Explain in brief	
J	What do you understand by Station Keeping? What are the methods used for that?	
K	Why is Uplink frequency greater than the downlink frequency? Explain.	
L	What are the types of Launch Vehicles used for Satellite Launching?	
M	What are the requirements of an Earth Station antenna?	
N	Write brief notes on the advantages and disadvantages of using satellites in LEOs, MEOs and GEOs for satellite communications.	
O	What are the functions carried out in Telemetry, Tracking & Command (TT&C) Subsystem?	
P	Calculate the gain of a 3m paraboloidal antenna operating at a frequency of 12GHZ. Assume an aperture efficiency of 0.5.	
Q	Derive and express the link equation for received power at the earth	

	station.
R	Explain the EIRP & Transmission losses.
S	Explain the carrier to noise ratio of uplink & downlink frequency.
T	Write notes on atmospheric absorption and scintillation at troposphere and ionosphere.
U	Derive the expression for C/N for uplink.

Option 2

Q2, Q3 and Q4 (20 Marks Each)	Solve any Two Questions out of Three	10 marks each
A	State and explain Kepler's law of planetary motion with a diagram.	
B	Define the following with respect to TWT amplifier a. 1 dB compression point b. Input and Output back-off c. 3rd order Intermodulation Noise d. Am/PM conversion coefficient	
C	With the help of a block diagram, describe working of transmit receive earth station used for telephone traffic.	
D	Explain the principle behind spreading and despreading and how it is used to minimize interference in a CDMA system.	
E	What are the different types of lasers used for satellite communication? Explain acquisition link model for optical communication.	
F	Explain TT & C subsystem. Explain the role of multi tone frequency in tracking.	
G	Discuss the mechanics of launching a satellite	
H	What is the earth eclipse of a satellite? Are there any ways of avoiding an eclipse during the lifetime of a satellite.	
I	Write short note on tracking techniques in geostationary satellites.	
J	Explain different types of antennas used in satellite communication system with its purpose.	
K	Determine how many carriers can access an 80 MHz transponder in the FDMA mode given that each carrier required bandwidth of 6MHz, allowing for 6.5 dB o/p back off. Compare this number with the number of carriers possible without back off.	
L	An LNA is connected to a receiver which has a noise figure of 12 dB. The gain of LNA is 40 dB and its noise temperature is 120K. Calculate the overall noise temperature referred to LNA input.	
M	Explain in detail the operation of the Spade system of demand assignment. Explain what is meant by thin route service? Suggest the type of satellite access is most suitable for this service.	
N	Explain bandwidth limited and power limited FDMA in detail.	
O	What are the different types of lasers used for satellite communication? Explain photo detector noise model.	
P	Derive the expression for antenna look angles.	
Q	What are different orbital elements?	
R	What are the methods used for attitude control? Explain them.	
S	Derive the expression for combined uplink/downlink C/N ratio.	

Option 3

Q2, Q3 and Q4. (20 Marks Each)	
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A	Solve any Two	5 marks each
i.	Explain spacecraft power subsystem.	
ii.	List out different phenomena which lead to signal loss on transmission through the earth's atmosphere	
iii.	Explain the Satellite switched TDMA.	
B	Solve any One	10 marks each
i.	Describe the operation of typical VSAT system. State briefly where VSAT systems find widest applications.	
ii.	Describe and compare the MATV and CATV systems.	
iii	Explain different types of antennas used in satellite communication.	
iv	Explain SPADE system.	
v	Compare TDMA, FDMA & CDMA multiple access techniques in satellite communication.	
vi	Explain LASER satellite communication.	
vii	Write short note on reliability and quality assurance.	
viii	What are design considerations of earth station?	
ix	Explain pre assigned/demand assigned TDMA.	

Note: This is the sample Question bank. The questions from question bank may or may not be included in final examination.