



Enrollment No.....

## Faculty of Engineering

End Sem (Odd) Examination Dec-2019

EC3EC04/EI3EC04 Satellite Communication

Programme: B.Tech.

Branch/Specialisation: EC/EI

**Duration: 3 Hrs.****Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1 i. Which one is popularly known as early bird? **1**  
 (a) INSAT (b) INTELSAT  
 (c) GSAT (d) TELSTAR
- ii. A geostationary satellite orbits the earth once in **1**  
 (a) 24 hours (b) 6 hours (c) 12 hours (d) 1 hours
- iii. The point where the orbit crosses the equatorial plane going from south to north? **1**  
 (a) Ascending node (b) Descending node  
 (c) Prograde node (d) Retrograde node
- iv. The pointing direction from the satellite to the subsatellite point is called **1**  
 (a) Zenith (b) Nadir (c) Azimuth (d) Elevation
- v. The frequency for C band in satellite communication is **1**  
 (a) 14/11 GHz (b) 6/4 GHz  
 (c) 9/16 GHz (d) 4/8 GHz
- vi. In Ku band, circular reflectors are used to provide **1**  
 (a) Hemispheric beam (b) Zone beam  
 (c) Global beam (d) Spot beam
- vii. The uplink design does not depend on **1**  
 (a) Saturation flux density (b) Input back-off  
 (c) Earth station HPA (d) Satellite TWTA output
- viii. DTH TV receiver planned broadcasting takes place in **1**  
 (a) L band (b) S band (c) C band (d) Ku band
- ix. Which multiple access technique is most suitable for digital transmission? **1**  
 (a) CDMA (b) TDMA (c) FDMA (d) All of these

P.T.O.

- x. The VSAT mostly uses **1**  
 (a) Demand access with TDMA  
 (b) Demand access with FDMA  
 (c) Demand access with CDMA  
 (d) None of these
- Q.2 i. What is the need of space communication? **2**  
 ii. Explain the satellite services with examples. **3**  
 iii. Write down the history of satellite communication. **5**  
 OR iv. Write a detail note on geosynchronous satellite with an example. **5**
- Q.3 i. Define sub satellite point. **2**  
 ii. Define the earth eclipse of satellite. **3**  
 iii. Explain the orbital perturbations in detail. **5**  
 OR iv. Explain the ground station antenna look angles. **5**
- Q.4 i. Calculate the reliability of a command receiver for 6 years lifetime, given that the MTBF of the batch of receiver is 35000 hours. **2**  
 ii. Write a note on thermal protection system of the satellite. **3**  
 iii. Explain the Attitude and Orbit Control system in detail. **5**  
 OR iv. Explain the Telemetry, Tracking and Command system in detail. **5**
- Q.5 i. Define the noise factor. **2**  
 ii. What is a direct broadcast satellite? **3**  
 iii. Derive the link design formula for satellite. **5**  
 OR iv. Explain the propagation impairments in the space link. **5**
- Q.6 i. Define the term multiple access. **2**  
 ii. Distinguish between pre-assigned and demand-assigned TDMA satellite access. **3**  
 iii. Explain the demand access multiple access technique. **5**  
 OR iv. Explain the merits and demerits of TDMA over FDMA. **5**

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**Marking Scheme**  
**EC3EC04/EI3EC04 Satellite Communication**

Q.1	i.	Which one is popularly known as early bird? (b) INTELSAT		1
	ii.	A geostationary satellite orbits the earth once in (a) 24 hours		1
	iii.	The point where the orbit crosses the equatorial plane going from south to north? (a) Ascending node		1
	iv.	The pointing direction from the satellite to the subsatellite point is called (b) Nadir		1
	v.	The frequency for C band in satellite communication is (b) 6/4 GHz		1
	vi.	In Ku band, circular reflectors are used to provide (d) Spot beam		1
	vii.	The uplink design does not depend on (d) Satellite TWTA output		1
	viii.	DTH TV receiver planned broadcasting takes place in (d) Ku band		1
	ix.	Which multiple access technique is most suitable for digital transmission? (b) TDMA		1
	x.	The VSAT mostly uses (b) Demand access with FDMA		1
Q.2	i.	Need of space communication (As per explanation)	2 marks	2
	ii.	BSS with examples.	1 mark	3
		FSS with example	1 mark	
		MSS with example	1 mark	
		History of first satellite	1 mark	
	iii.	World history of satellite	2 marks	5
		Indian history of satellite	2 marks	
OR		iv.	Definition of geosynchronous	
	Diagram of geosynchronous	1 mark		
	Example explanation (INSAT or GSAT)	3 marks		
Q.3	i.	Define sub satellite point (As per answer)	1 mark	2
		Diagram.	1 mark	

	ii.	Define the earth eclipse of satellite. (As per answer)	2 marks	3
		Diagram	1 mark	
	iii.	Earth oblateness and atmosphere related effects	2 marks	5
		Effect of gravitational forces of the sun and moon	2 marks	
OR		Diagram	1 mark	
	iv.	Diagram of look angles	1 mark	5
		Elevation angle explanation	2 marks	
		Azimuth angle explanation	2 marks	
Q.4	i.	Calculate the reliability of a command receiver for 6 years lifetime, given that the MTBF of the batch of receiver is 35000 hours Sol. $T=6*365*24$ hours		2
		$R = \exp [-6*365*24/35000]=0.2226$	2 marks	
	ii.	Need of thermal protection	1 mark	3
		Means of thermal protection .	2 marks	
	iii.	Satellite attitude diagram of 3 axes	1 mark	5
		Attitude control mechanism	2 marks	
		Orbit control mechanism	2 marks	
	iv.	Complete diagram of TTC system	2 marks	5
OR		Telemetry	1 mark	
		Tracking	1 mark	
		Command	1 mark	
Q.5	i.	Define the noise factor.	1 mark	2
		Equation of noise factor	1 mark	
	ii.	Direct broadcast satellite		3
		Diagram	1 mark	
		Definition	1 mark	
		Name of the types (analog and digital DBS)	1 mark	
	iii.	Diagram	1 mark	5
		Derivation of 5 steps	3 marks	
		Expressed in decibels	1 mark	
	iv.	Propagation impairments in the space link.		5
		Rain attenuation	1 mark	
		De polarization effect	1 mark	
OR		Polarization rotation effect	1 mark	
		Atmospheric absorption	1 mark	
		Refractive effect of ionosphere	1 mark	
Q.6	i.	Definition	1 marks	2
		Types	1 mark	

OR	ii.	Pre-assigned	1.5 mark	<b>3</b>
		Demand-assigned	1.5 mark	
	iii.	Definition	1 mark	<b>5</b>
		Diagram	1 mark	
		Explanation	3 marks	
	iv.	Merits	3 marks	<b>5</b>
		Demerits	2 marks	

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