Punjab Engineering College (Deemed to be university)
End-Term Examination

Programme: B.E(ECE)
Course Name: Advanced Communication
Maximum Marks: 50
Notes:

Year/Semester: 21221/5th sem
Course Code: ECN 302
Time Allowed: 2 Hours

- All questions are compulsory.
- The candidates, before starting to write the solutions, should please check the question paper for any discrepancy and also ensure that they have been delivered the question paper of right course code.

Sr. No.		Question	Marks
1.	(a)	Why are source encoding and channel encoding used? With mapping each 6-bit sequence into a unique 8-bit sequence, what would be the amount of redundancy?	1
	(b)	Orthogonality in two low pass equivalent signals implies orthogonality in their corresponding band pass signals. Is this statement true? Support your answer with proper derivation.	2
	(c)	Derive the d_{min} for m-arry PSK considering E_b as energy per bit?	2
	(d)	Tell the spectrum bands used in satellite communication. Explain the reasons for downlink frequency to be lower than uplink frequency in satellite communication system. Also explain the three-axis used to control the orientation of the satellite with diagram.	3
	(e)	An optical fiber core is made of glass with refractive index 1.5 and its cladding is made of another glass with refractive index 1.35. Find its numerical aperture and acceptance angle.	1
	(f)	What do you mean by Composite Video Signal? What is the role of synchronization signals?	1
2.	(a)	Represent the low pass equivalent of band pass signal x(t) w.r.to central frequency f_o in polar co-ordinates form expressing x(t) in terms of its magnitude and phase.	5
	(b)	Suppose $<x_1,x_2,x_3>$, where $x_1=[1,2,3]$, $x_2=[1,0,2]$, $x_3=[0,4,3]$, is a basis for a subspace W of R^3. Describe an orthogonal basis for W using Gram Schmidt procedure.	3
3.	(a)	Explain the signal representation of M-arry Frequency shift keying (FSK) using orthonormal basis functions. Also find out the condition on minimum frequency separation that guarantees orthogonality in signals.	5
	(b)	Explain the Biorthogonal signals and simplex signals	2
	(c)	What is the advantage of continuous phase modulation schemes? Explain the offset QPSK modulation technique in detail with proper diagrams.	3
4.	(a)	Explain in detail with proper diagram that how video signals are generated from optical information.	3

	(b)	Differentiate between positive and negative modulation techniques in term of picture signal transmission. Which one is better and why?	2
	(c)	A step-index fiber cable has core diameter 3 μm and operates with infrared light at 1.5μm. It has numerical aperture of 0.4. Find the normalized cutoff frequency and number of modes it will support. If this fiber is redesigned in graded index fiber with profile index of 3, find the number of modes it will support now.	2
	(d)	Determine the optical power received in dBm and watts for a 12km optical fiber link with following parameters: LED output power of 5mW, three 4km sections of cable each with loss of 0.4dB/km, two cable to cable connectors with a loss of 5 dB each, light source to fiber interface loss of 1.5dB, and fiber to light detector loss of 2.5dB.	3
	(e)	Explain all the losses present in optical fiber communication in detail.	2
5.	(a)	In a satellite communication link the uplink carrier to noise ratio is 22 dB whereas the downlink carrier to noise ratio is 16 dB. Find the link carrier to noise ratio.	3
	(b)	Explain all the three Kepler's law with the diagrams and proper derivation of third Kepler's law in relation with satellite communication. Using third Kepler's law calculate the height of Geo-Synchronous orbit given that one sidereal day has 86164 sec.	3
	(c)	Find Incremental velocity required to place a satellite in Geosynchronous Transfer Orbit (GTO) from parking orbit at 520 km. And also find the incremental velocity required from GTO to Geostationary Orbit (GSO). Assume zero inclination for GTO and GSO. $G=6.67*10^{-11}$ Nm^2/kg^2, $M=5.98*10^{24}$ kg.	4