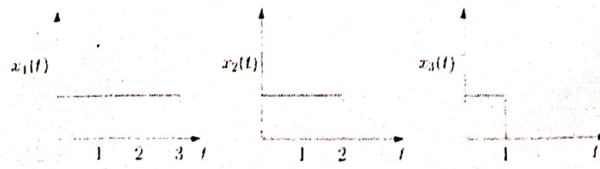| 5-Evaluating | 15 |
|---|---|
| 6-Creating | ? |

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

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

Year/Semester: 20211/5ᵗʰ sem
Course Code: ECN 302
Time Allowed: 2 Hours

- Attempt any five questions.
- First questions is 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) | Differentiate between source encoding and channel encoding. | 1 |
| | (b) | Orthogonality in two pass band signal implies orthogonality in their corresponding low pass equivalent signals. Is this statement true? Support your answer with proper derivation. | 2 |
| | (c) | Write the signal representation of M-arry Phase Shift Keying (PSK) modulation scheme. What will be $d_{min}$ for 16-arry PSK considering $E_b$ as energy per bit? | 2 |
| | (d) | Explain the reasons for downlink frequency to be lower than uplink frequency in satellite communication system. Provide some advantages of 6/4 GHz band. | 2 |
| | (e) | An optical fiber core is made of glass with refractive index 1.6 and its cladding is made of another glass with refractive index 1.55. Find its numerical aperture and acceptance angle. | 2 |
| | (f) | What do you mean by Composite Video Signal? | 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) | Determine the set of orthonormal basis functions for the set of three signals shown in fig.1. Then use these basis functions to represent these waveforms by vectors $S_1$, $S_2$, and $S_3$.  FIG. 1 | 5 |
| 3. | (a) | Explain the signal representation of Quadrature Amplitude Modulation (QAM) in vector form using orthonormal basis functions. Also discuss about its constellation diagram. | 5 |

| | | | |
|---|---|---|---|
| | (b) | What is Hadamard orthogonal signals? Explain it with $H_2$ Hadamard matrix. | 2 |
| | (c) | What is the advantage of continuous phase modulation schemes? Explain phase of carrier, modulation index, and pulse shape in Minimum Shift Keying (MSK) modulation. | 3 |
| 4. | (a) | Draw and explain the block diagram of optical fiber communication system. | 3 |
| | (b) | Classify the optical fiber cables in terms of index profile. | 2 |
| | (c) | A step-index fiber cable has core diameter 5μm and operates with infrared light at 1.3μm. 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 15km optical fiber link with following parameters: LED output power of 30mW, three 5km sections of cable each with loss of 0.4dB/km, two cable to cable connectors with a loss of 2 dB each, light source to fiber interface loss of 1.9dB, and fiber to light detector loss of 2.1dB. | 3 |
| 5. | (a) | In a satellite communication link the uplink carrier to noise ratio is 15dB whereas the downlink carrier to noise ratio is 20dB. Find the link carrier to noise ratio. | 3 |
| | (b) | Explain all the three Kepler's law with diagrams in relation with satellite communication. | 2 |
| | (c) | Find Incremental velocity required to place a satellite in Geosynchronous Transfer Orbit (GTO) from parking orbit at 620 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. | 5 |
| 6. | (a) | Explain the block diagram of TV transmitter and receiver system in detail. <br><br> What is the role of synchronization signals? | 6 |
| | (b) | Explain the vestigial sideband (VSB) modulation scheme and its advantages over amplitude modulation (AM) scheme. | 4 |