



(Pages : 3)

A – 4199

Reg. No. :

Name :

**Fourth Semester B.Tech. Degree Examination, June 2016
(2013 Scheme)**

13.404 : DATA COMMUNICATION (FR)

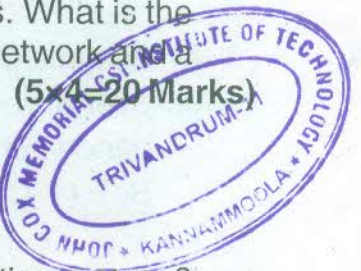
Time : 3 Hours

Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries 4 marks.

1. State Shannon's channel capacity theorem. Assume that a TV picture is to be transmitted over a channel with 4.5 MHz bandwidth and a 35 dB signal to noise ratio. Find the capacity of the channel.
2. Differentiate synchronous and asynchronous transmission. Suppose the sender and receiver use asynchronous transmission and agree not to use stop elements. Could this work? If so, state the necessary condition.
3. Why should PCM be preferable to DM for encoding analog signals that represent digital data?
4. Calculate the hamming pair-wise distances among the following codewords :
 - i) 00000, 10101, 01010
 - ii) 000000, 010101, 101010, 110110.
5. Differentiate between virtual circuit and datagram routing methods. What is the role of the address field in a packet, travelling through a datagram network and a virtual circuit network?



PART – B

Module – I

6. a) What is meant by simplex, half duplex and full duplex communication system? Give representative examples of each. 6
- b) Describe the structure of an optical fiber and explain the mechanism of light propagation along the fiber. 7
- c) What basic function does a communication satellite perform? Give a good reason why up-link and down-link frequencies are not same. Why earth dish antenna generally is parabolic in shape? 7

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7. a) Compare transmission of analog data and signal with digital data and signal ? Also tell which one is the best method and why ? 7
- b) Explain various transmission impairments in data transmission. 5
- c) What are the different types of noise in a communication channel ? 3
- d) According to the Shannon's Channel capacity theorem : Channel capacity $C = B \cdot \log(1 + S/N)$ Answer the following questions with respect to the Channel capacity theorem : (1) When the Bandwidth increases, what happens ? (2) When the Signal to Noise Ratio increases, what happens ? (3) When the Signal to Noise Ratio S/N tends to infinity what happens ? (4) When the Bandwidth tends to infinity what happens ? 5

Module – II

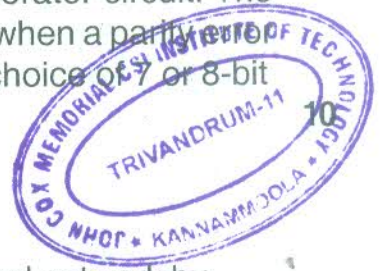
8. a) A system is designed to sample analog voltage signals using a 3-bit PCM codec. Assume that the voltage values are in the range of 0 to 5 Volts. Sketch and briefly describe the various stages of a PCM codec. 10
- b) Suppose that a single frequency carrier signal $c(t)$ at frequency $f_c = 1$ MHz is AM modulated by a single frequency data signal $x(t)$ at frequency $f_x = 10$ KHz. Sketch the spectrum of the resulting AM modulated signal. 10
9. a) A channel with bandwidth of 4 kHz is available what data rates can be supported by the BPSK and QPSK modulation schemes. Assume RC pulses with a roll-off factor $\alpha = 0.5$. Ignore noise. 10
- b) Assume that a telephone line is equalized to allow band-pass data transmission over a frequency range of 300 to 3400 Hz. For $r = 0$, evaluate the required bandwidth for 2400 bps QAM. Is the bandwidth adequate ? Recall that $B_T = (1 + r)R/b$, where b is the number of bits sent per baud ? 10

Module – III

10. a) Explain about the channel spacing's used in a DWDM and WDM system and what wavelength ranges are used ? 10
- b) A Hamming code is described as a (7, 4) code. Explain the purpose of Hamming code, the significance of "7" and "4" and any other important quantities following from the (7, 4) description and its properties. 10



- 11. a) Explain what is meant by the term “four-wave mixing”; describe the impact of the phenomenon on DWDM system operation and techniques for reducing the effect. 10
- b) Design, construct and verify the operation of a parity generator circuit. The circuit allows selection of even or odd parity and indicates when a parity error occurs. Another option for the circuit is to operate with a choice of 7 or 8-bit data inputs. 10



Module – IV

- 12. a) Discuss the switching technique used for a packet switched network by datagram and virtual circuit approach. 5
- b) Describe briefly the various capacity allocation strategies and explain how the frequency based capacity allocation schemes CDMA is used to allocate the required frequencies for data transmission ? 15
- 13. a) What is the use of spread spectrum ? Sketch the block diagram of the Transmitter and Receiver of DSSS. Explain what each block does and what the signal looks like (in time and/or frequency domains) at each location in the block diagram with an example. 15
- b) Differentiate between GSM and GPRS. 5
