Reg. No.



MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL 576104 (Constituent College of Manipal University)



## FOURTH SEMESTER B.TECH. (IT) DEGREE MAKEUP EXAMINATION, JUNE – 2016 SUBJECT: PRINCIPLES OF DATA COMMUNICATION – ICT 202 (REVISED CREDIT SYSTEM)

| TIME: 3 HOURS | 28/06/2016 | MAX. MARKS: 50 |
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## Instructions to candidates

Answer **Any FIVE FULL** questions. Missing data, if any, may be suitably assumed.

- 1A. Explain the concept of CDMA. Consider a scenario where user A [-1 1 -1 1 1 -1], user B [1 -1 -1 1 1] and user C [1 1 -1 1 -1 -1] are to modulate the data pattern 1 0 1 respectively using their chip patterns. Show the transmitted signal. Show the decoding corresponding to individual user.
- 1B.If the received signal level for a particular digital system is -151 dBW and the receiver system effective noise temperature is 1500 K, what is the  $E_b / N_0$  for a link transmitting 2400bps.
- 1C.Explain the transmission characteristics and applications of optical fibre cable. [5+3+2]
- 2A. Differentiate between flow control and error control mechanisms. Explain how Go-back-N ARQ mechanism achieves error control.
- 2B. Suppose a transmitter at TV station produces 80 W of power.
  - i. Express the transmit power in units of dBm and dBW.
  - ii. Determine the height of an antenna for a TV station that must be able to reach customers up to 120 km away.
  - iii. If the transmitter's power is applied to a unity gain antenna with a 750-MHz carrier frequency, what is the received power in dBm at a free space distance of 100 m?
- 2C. Differentiate between synchronous and statistical time division multiplexing techniques. [5+3+2]
- 3A. Explain the concept of **slow** Frequency Hop Spread Spectrum (FHSS) with suitable example and necessary equations. If an FHSS system employs a total bandwidth of  $W_s = 400$ MHz and an individual channel bandwidth of 100 Hz, what is the minimum number of PN bits required for each frequency hop?
- 3B. Briefly explain the three frame types supported by HDLC.
- 3C. Assume the data is stored on 2 MB floppy diskettes that weigh 25 gm each. Calculate the data transmission rate in bits per second if an airliner carries 10<sup>4</sup> kg of these floppies at a speed of 1000 km/h over a distance of 6700 km. [5+3+2]
- 4A. A CRC is constructed for 10 bit data 1 0 0 0 1 1 1 0 1 0 using the generator polynomial  $X^4 + X^3 + 1$ . Generate the FCS, find the transmitted code word and validate the received code using modulo- 2 arithmetic assuming error free transmission.
- 4B. Explain the three types of switching techniques.
- 4C. For a telephone transmission facility with a given narrow (usable) audio bandwidth, a nominal  $SNR_{dB}$  of 56 dB and a distortion level of < 0.2%.
  - i. What is the theoretical maximum channel capacity (kbps) of traditional telephone lines?
  - ii. What is the actual maximum channel capacity?

[5+3+2]

- 5A.Explain the different modes of wireless propagation of a signal radiated from an antenna. Derive the equation  $d = 3.54\sqrt{h}$ , where *d* is the distance between an antenna and the horizon in kilometres with no intervening obstacles and *h* is the antenna height in meters. Assume the earth's radius is 6370 kms and the antenna is perpendicular to the earth's surface.
- 5B. Explain the need for analog modulation of analog signals and explain the different techniques with suitable diagrams.
- 5C. Calculate the Hamming pair wise distances among the following code words.010101, 100110, 111100, 010111 [5+3+2]
- 6A.If the transmitted digital signal for the data '1 0 1 1 1 0 0 1 0' using the following encoding techniques
  - i. Manchester (Assume signal level had HIGH to LOW transition during the most preceding mid bit transition)
  - ii. NRZ–I (Assume signal level for the preceding bit was LOW)
  - iii. Bipolar AMI (Assume the most recent preceding 1 bit had positive voltage)
  - iv. Differential Manchester (Assume signal level had HIGH to LOW transition during the most preceding mid bit transition)
  - v. State the advantage of Manchester and Differential Manchester encoding scheme over other schemes.
- 6B. Explain the terms Ground wave propagation, Sky wave propagation and Line of Sight Propagation with respect to the wireless signal propagation.
- 6C. List and explain any two communication tasks involved in data communication system. [5+3+2]