Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

III SEMESTER B.TECH. (INFORMATION TECHNOLOGY)

MAKEUP EXAMINATIONS, DEC 2017/JAN 2018

SUBJECT: PRINCIPLES OF DATA COMMUNICATION [ICT 2104]

REVISED CREDIT SYSTEM
(30 /12 /2017)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL the questions.
- Missing data, if any, may be suitably assumed.

1A. Describe the unipolar, polar and bipolar signal encoding techniques with appropriate diagrams for each. 5

1B. Compare and contrast analog and digital data transmission techniques. Also mention one real time application of each of these techniques in data communication. 3

1C. Express the following in the simplest form possible: 2
(i) $\sin(2\pi ft - \pi) + \sin(2\pi ft + \pi)$
(ii) $\sin 2\pi ft + \sin(2\pi ft - \pi)$

2A. Describe how the data transmission takes place in Frequency Division Multiplexing (FDM) with a neat labelled block diagram indicating the processes at both the sender and receiver of the signals/data. 5

2B. What SNR ratio is required to achieve a bandwidth efficiency of 1.0 for ASK, FSK, PSK, and QPSK? Assume that the required bit error rate is 10^{-6}. 3

2C. Determine the isotropic free space loss in decibels (L_{DB}) at 8 GHz for the shortest path to a synchronous satellite from earth (35,863 km). Carrier Wavelength $\lambda = 0.095$ m. 2

3A. Realize a CRC circuit for D = 101101; P = 1101 using shift registers. Explain the steps involved in checking for an error on the receiver side with a suitable shift register CRC circuit. 5

3B. Draw the graph of the NRZ-L scheme using each of the following data streams, assuming that the last signal level has been positive. From the graphs, guess the bandwidth for this scheme using the average number of changes in the signal level. 3
(i) 00000000 (ii) 11111111 (iii) 01010101 (iv) 00110011

3C. A World Wide Web server is usually set up to receive relatively small messages (queries) from its clients and transmit potentially very large messages 2

(in the form of responses) to the respective clients. Explain which type of ARQ protocol (selective reject, go-back-N) would provide less of a burden to a particularly popular WWW server.

4A. Explain the three station data trasfer modes and two link configurations supported by HDLC with relevant diagram(s). 5

4B. Describe the three types of transmission impairments with an example for each. 3

4C. Design a three-stage, 200 × 200 switch (N = 200) with k = 4 and n = 20. 2

5A. Describe the role of Spread Spectrum in Digital Communication Systems to avoid jamming and interception. Explain how signal(s) are broadcasted over a random series of radio frequencies using Frequency Hopping Spread Spectrum (FHSS). 5

5B. Explain the following distinguishing characteristics of optical fiber from twisted pair or coaxial cable: 3

(i) Data Carrying Capacity
(ii) Size and Weight
(iii) Attenuation

5C. In satellite communications, different frequency bands are used for the uplink and the downlink data/signal transmission. Give valid reasons justifying your answer. 2