

**M.Sc./II Sem. - 2014**  
**INFORMATICS - Paper IT-21**  
**Voice and data Communication**

*Time: 3 hours*

*Maximum Marks: 75*

*(Write your Roll No. on the top immediately on receipt of this question paper)*

*Attempt five questions in all.*

**Q.1(a)** What do you understand by (i) Single-Bit error and (ii) Burst error?

(4)

(b) Explain with the help of schematic diagram the detection and correction of error in Block coding?

(5)

(c) Discuss the concept of redundancy in error detection and correction.

(3)

(d) Distinguish between forward error correction versus error correction by transmission.

(3)

**Q.2(a)** What is Hamming distance? Find all the Hamming distances and also the minimum Hamming distance of the coding scheme shown in TABLE:1. How many error the block code scheme of TABLE:1 can detect?

**Table:1**

Dataword	Codeword
00	00000
01	01011
10	10101
11	11110

(6)

(b) What do you understand by (i) Minimum Distance for Error Detection and (ii) Minimum Distance for error Correction?

(4)

(c) Prove that the code represented in Table:2 is not a linear code.

(5)

**Table:2**

Dataword	Codeword
0	00000
1	01011
2	10111
3	11111

**Q.3(a)** Sketch schematic diagram for CRC encoder and decoder.

(2)

(b) Show that

$$(x^5 + x^3 + x^2 + x)(x^2 + x + 1) = x^7 + x^6 + x^3 + x$$

(3)

(c) Referring to the CRC-8 polynomial  $x^8 + x^2 + x + 1$ , answer the following questions: (5)

(i) Does it detect a single error? Defend your answer.

(ii) Does it detect burst error of size 6? Defend your answer.

(iii) What is the probability of detecting burst error of size 9?

(d) Given the dataword 1010011010 and the divisor 10111, (5)

(i) Show the generation of the codeword at the sender site (using binary division)

(ii) Show the checking of the codeword at the receiver site (assume no error).

Q.4(a) Draw a schematic diagram that describes the optical fibre communication system. (2)

(b) What do you mean by numerical aperture? Write the expression for the numerical aperture. (2)

(c) Explain the difference between step index and graded index fibers. (3)

(d) An optical system is provided with the following data: (5)

Core refractive index=1.55; Cladding refractive index=1.47; Propagating wavelength=1.2  $\mu m$ ; Radius of the core=52  $\mu m$ .

Determine (i) V number and (ii) Number of modes propagating through the fiber.

(e) What do you understand by (i) Signal element and (ii) Data element? In a digital transmission, the receiver clock is 0.1 percent faster than the sender clock. how many extra bit per second does the receiver receive if the data rate is 1Mbps. (3)

Q.5(a) Explain the following terms (4)

(i) Analog Signal

(ii) Digital Signal

(iii) Analog Communication System

(iv) Digital Communication System

(b) Define: (2)



- (i) Bandwidth of an information signal
- (ii) Bandwidth of a communication channel
- (c) For a circuit with a signal power of 1000W and a thermal noise power of 0.02mW, determine the signal-to-noise power ratio in absolute and dB values. (2)
- (d) What is meant by Electrical Noise? Consider we have 2 generators operating at a distance of 20 metres from each other. An antenna transmitting signals is placed midway between these generators. Share your opinion on the impact the noise generated by these generators will have on the signals being transmitted by the antenna. (4)
- (e) What is meant by Wave symmetry? Describe the different types: Even, Odd and Half-wave? (3)
- Q.6(a) Differentiate between Analog and Digital Modulation? (2)
- (b) What is a MODEM? Explain its significance. (3)
- (c) Explain using waveforms the concept of Phase-Shift-Keying (PSK) and Frequency-Shift-Keying (FSK). (5)
- (d) Describe the following terms: Information Capacity, bit, bit-rate and baud? What is the information capacity in bps for a circuit with a 100-kHz bandwidth and a signal-to-noise ratio of 40dB? (5)