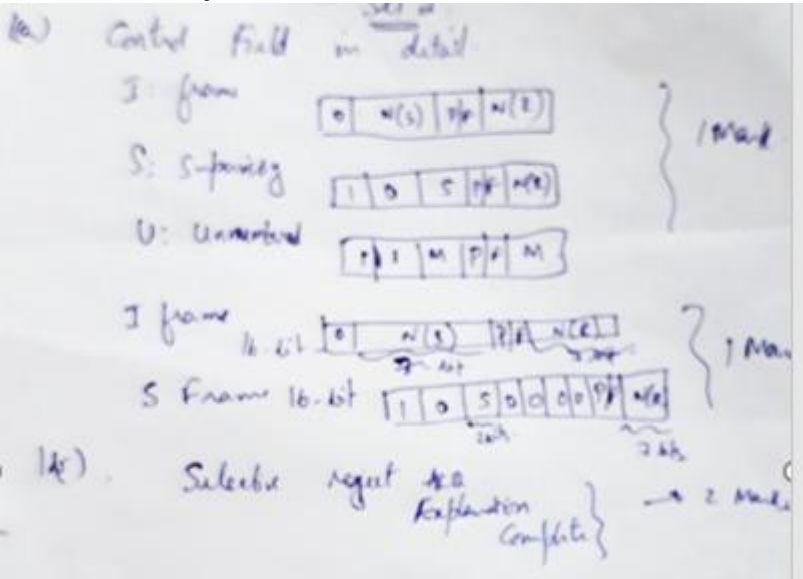
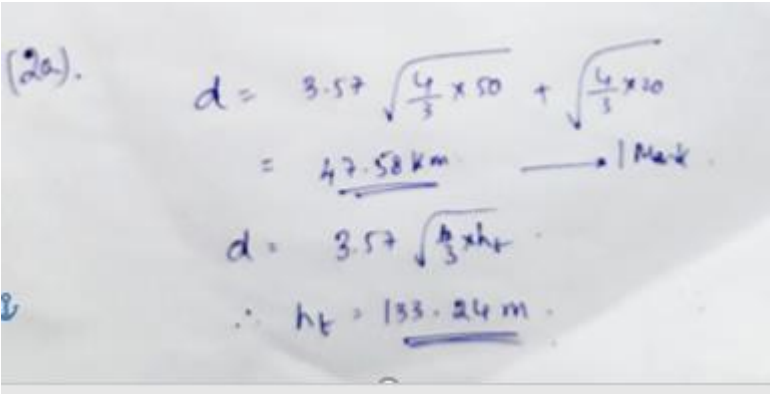
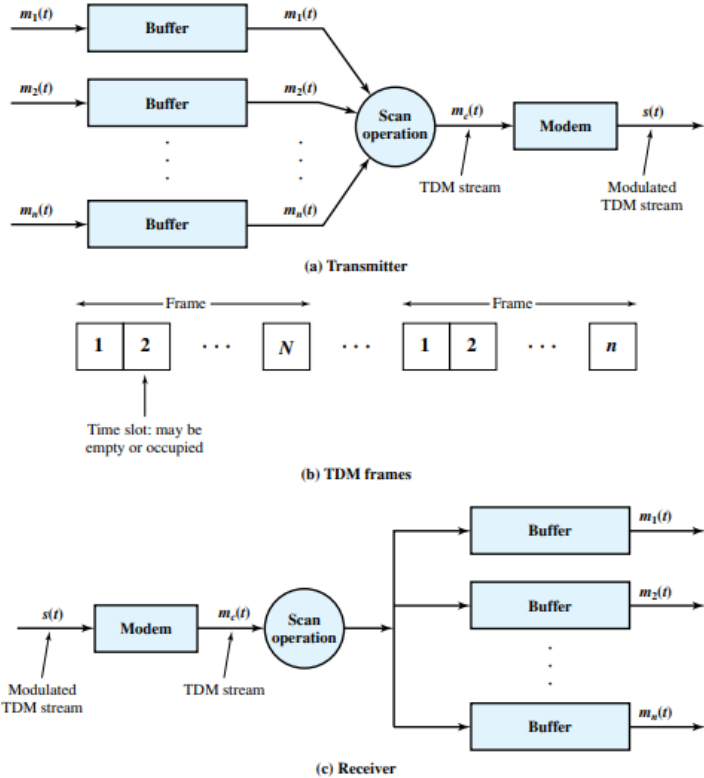
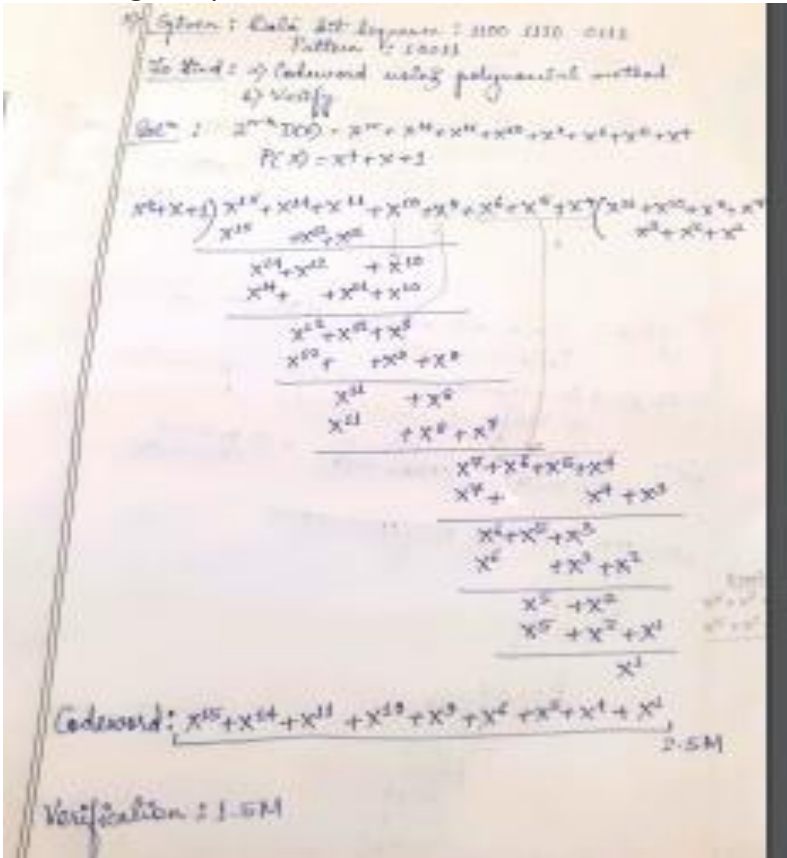


III SEMESTER B.TECH.  
(INFORMATION TECHNOLOGY/COMPUTER & COMMUNICATION ENGINEERING)  
IN-SEMESTER EXAMINATIONS, DECEMBER 2021  
SUBJECT: PRINCIPLES OF DATA COMMUNICATION [ICT 2156]  
SCHEME OF EVALUATION  
TOTAL MARKS: 20 M

SET-2

1	<p>a. With respect to the standard HDLC frame format, explain the control field features in detail.</p> <p>b. With respect to the error control mechanism, explain the concept of selective reject ARQ.</p>  <p>The diagram shows the control field structure for three types of frames: I-frame, S-frame, and U-frame. Each frame has a flag (F) and a control field (C). The control field is divided into four parts: N(s), P/F, N(r), and C. For I-frame, N(s) is 0, P/F is 1, N(r) is 0, and C is 0. For S-frame, N(s) is 1, P/F is 0, N(r) is 0, and C is 0. For U-frame, N(s) is 1, P/F is 1, N(r) is 0, and C is 0. The diagram also shows the 16-bit structure of I-frame and S-frame, with N(s) and N(r) fields. Below this, it explains selective reject ARQ, stating that it is a combination of stop-and-wait and selective repeat, and is used for error control.</p>	1+1+2
2	<p>a. Given that the transmitter and receiver antenna height is 50meters and 20meters respectively, what should be the height of transmitter antenna alone required, if the receiving antenna is at ground level?</p>  <p>The diagram shows the calculation for the height of the transmitter antenna. It starts with the formula for the distance d between two antennas at heights h1 and h2, separated by a distance d. The formula is <math>d = 3.57 \sqrt{\frac{4}{3} \times 50} + \sqrt{\frac{4}{3} \times 20}</math>. This simplifies to <math>d = 47.58 \text{ km}</math>. Then, it uses the formula <math>d = 3.57 \sqrt{h_t \times h_r}</math> to find the height of the transmitter antenna <math>h_t</math>. Substituting the values, it gets <math>h_t = 133.24 \text{ m}</math>.</p>	1+1

	<p>b. What is the channel capacity for a telephone channel with a 240-Hz bandwidth and a signal-to-noise ratio of 40 dB, where the noise is white thermal noise?</p>	0.5+0.5
3	<p>For the bit stream 01011100000001000110, sketch the waveforms for Manchester, bipolar AMI and B8ZS. Assume that the signal level for the preceding bit for NRZI was high; the most recent preceding 1 bit (AMI) has a negative voltage, and the most recent preceding 0 bit (pseudo ternary) has a negative voltage.</p>	1+1+1
4	<p>With a neat block diagram of transmitter and receiver, explain how synchronous time-division multiplexing (TDM) works</p> <p>Block Diagram carries 1.5 marks and detailed Explanation carries 1.5 marks</p>	1.5 +1.5

	 <p>(a) Transmitter</p> <p>(b) TDM frames</p> <p>(c) Receiver</p>	
5	<p>Using polynomial method representation, generate the codeword for the data bit sequence 1100 1110 0111 and verify at the receiver's end using the pattern 10011</p>  <p>Given: Data bit sequence: 1100 1110 0111 Pattern: 10011</p> <p>To find: Codeword using polynomial method</p> <p>Verify</p> <p>Gen: <math>2^{15} \cdot 100 = x^{15} + x^{14} + x^{13} + x^{12} + x^{11} + x^{10} + x^9 + x^8 + x^7</math>  <math>P(x) = x^4 + x + 1</math></p> <p>Codeword: <math>x^{15} + x^{14} + x^{13} + x^{12} + x^9 + x^8 + x^7 + x^4 + x^1 + x^0</math> 2.5M</p> <p>Verification: 1.5M</p>	2.5+1.5

6

What will be the checksum that Alice sends Bob for the following message? Show the steps of working. Verify at the receiver's end as well. Assume  $n = 8$  and the equivalent Hexadecimal value of  $A = 0x41$ .  
Message: REDUNDANCY

2+1

6) Given: Message = REDUNDANCY  
 $n = 8$       To find: Checksum & Verify

Soln:

R:	0101	0010	82
E:	0100	0101	45
D:	0100	0100	44
U:	0101	0101	55
N:	0100	1110	4E
D:	0100	0100	44
A:	0100	0001	41
N:	0100	1110	4E
C:	0100	0011	43
Y:	0101	1001	59

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101110 1101  
→ 10

Sum: 1110 1111

Checksum: 0001 0000 [2M]

Receiver:

101110	1101
0001	0000

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101111 1101  
→ 10

Sum: 1111 1111

Checksum: 0000 0000 [1M]