



**K. K. Wagh Institute of Engineering Education & Research, Nashik**  
(An Autonomous Institute From A.Y. 2022-23)

	InSem Examination-IWinter 2023		
	Exam Seat No.:		
	Academic Year:2023-2024	Semester:III	
	Name of Programme:B.Tech	Pattern:2022	
	Name of Course:Digital Communication	Course Code:INT222005	
	Max. Marks:30	Duration:1	

	<p><b>Instructions:</b> Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.</p> <ol style="list-style-type: none"><li>1. This question paper contains 2 (two) page(s).</li><li>2. Answer to each new question is to be started on a new page.</li><li>3. Assume suitable data wherever required, but justify it.</li><li>4. Draw the neat labelled diagrams, wherever necessary.</li><li>5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question</li></ol>	
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**Question No. 1 Attempt following Question**

- a) Justify the statement with suitable example -

*A high probability event conveys less information than a low probability event* (4) CO1

**OR**

- b) Explain Average Mutual Information (4) CO1  
c) Explain the Channel models categories (5) CO1

**OR**

- d) Explain Shannon Fano Elias Coding algorithm with example (5) CO1

e)

A Discrete Memoryless Source (DMS)  $X$  has five symbols  $x_1, x_2, x_3, x_4$ , and  $x_5$  with  $P(x_1) = 0.30$ ,  $P(x_2) = 0.25$ ,  $P(x_3) = 0.25$ ,  $P(x_4) = 0.15$ , and  $P(x_5) = 0.05$  probabilities respectively

- a) Construct the Huffman tree. (6) CO1
- b) Find the codeword for  $x_1, x_4$
- c) Find Entropy  $H(x)$  of the source

**OR**

f)

Explain Arithmetic Coding. Let our alphabet consists of only three symbols A, B and C with probabilities of occurrence as  $P(A)=0.5$ ,  $P(B)=0.25$ ,  $P(C)=0.25$ . Calculate the arithmetic code for ABCA. Explain each step. (6) CO1

**Question No. 2 Attempt following Question**

- a) List out the difference between Analog and Digital Signal (4) CO5

**OR**

- b) What is Noise? Explain different types of noise. (4) CO5
- c) Draw and explain components of Data Communication system (5) CO5

**OR**

- d) What is Data Communication? List and explain fundamental characteristics of Data Communication (5) CO5
- e) Explain Shannon Capacity Theorem. Consider an extremely noisy channel in which the value of the signal-to-noise ratio is almost zero. In other words, the noise is so strong that the signal is faint. For this channel, calculate the capacity. (6) CO5

**OR**

f)

Explain the following network performance parameters-

- i) Throughput (6) CO5
- ii) Latency (Delay)