Mawlana Bhashani Science and Technology University

Department of Information and Communication Technology

3rd year 1st Semester B. Sc (Engg.) Final Examination 2023

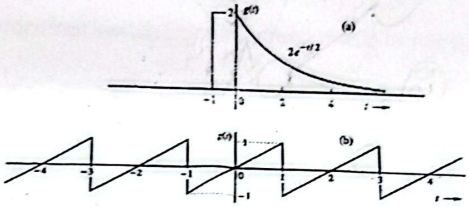
Course Title: Analog and Digital Communication | Course Code: ICT 3103
Full Marks: 70 | Time: 3 hour

Answer any five from the following questions

1. (a) What is communication system? Draw the block diagram of a communication system and explain the function of each block. 6
   (b) Define the bandwidth of a signal. List the bandwidth of few real-world signals. 3
   (c) As an engineer, what are the important characteristics of a channel you should consider. Write the name of three mostly useful channel and which one is advantageous-why? 5

2. (a) What are the limitations of communication systems? 2
   (b) Define modulating signal and carrier signal. Write the necessity of modulation in communication system? 6
   (c) With proper sketch, compare AM, FM, and PM. 6

3. (a) Determine the suitable measures of the signal in the following figure: 5



   (b) What is spectrum? Sketch the line spectrum of the following signal: 6
   $$g(t) = 3 - 5\cos(40\pi t - 30°) + 4\sin(120\pi t)$$
   (c) Find the Fourier transform of the everlasting sinusoid $\cos\omega_0 t$ and draw its spectrum. 3

4. (a) With the help of waveforms and spectrum, describe the concept of Amplitude modulation both in time domain and frequency domain. 5
   (b) As related to AM, what is over modulation, under modulation and 100% modulation? What happens for over modulation? 6
   (c) Show that transmission efficiency of AM wave is $= \frac{\overline{x^2(t)}}{[A^2+\overline{x^2(t)}]} \times 100\%$, where each symbols have their meanings. 3

5. (a) What are the basic steps to convert from analog to digital signals? 3
   (b) What is detector? What are the challenges of coherent detector? 3
   (c) Describe a synchronous detection method. 4
   (d) For FM Modulator with frequency deviation of 10 kHz, modulating signal frequency of 10 kHz, Carrier amplitude voltage of 50V and Carrier frequency of 500 kHz, determine Minimum Bandwidth using Carson's rule. 4

6. (a) With necessary circuit diagram and waveforms, explain how DSB-SC wave is generated using: 5
      i. Balance Modulators and
      ii. Ring Modulator
   (b) What are the advantages of SSB over DSB modulation technique? 3
   (c) What is the concept of VSB? Compare among DSB, SSB and VSB. 6

7. (a) Define PAM, PWM, PPM and write their applications. 3
   (b) State and explain sampling theorem 5
   (c) What is aliasing effect. How to avoid it? 3
   (d) Determine the signal to quantization noise ratio of PCM system. 3

8. (a) What is quantization? Show that the SQR for a sinusoidal input signal is $SQR = 1.76 + 6.02n\ dB$. Draw a table to show that how additional code bit improves SQR. 7
   (b) Mention the desirable properties of line coder. 4
   (c) Construct NRZ and RZ format for 011010. 3