



**AMERICAN INTERNATIONAL UNIVERSITY – BANGLADESH**  
**Faculty of Engineering**

**Course/Lab Name:** Data Communication

**Semester:** Spring 2023-24    **Term:** Final    **Quiz:** 01    **Total Marks:** 20    **Time:** 20 Minutes

**Question Mapping with Course Outcomes:**

Item	COs	POIs	K	P	A	Marks	Obtained Marks
All Problems	CO1	P.a.1.C3	K3	.	.	20	
Total:						20	

**Student Information:**

**Student Name:**

**Student ID:**

**Section:** H

**Department:**

**Answer the following Questions:**

**Problem 01:** (i) For a channel with bandwidth of 100 kHz, which spans from 200 to 300 kHz. Compute the following: (a) carrier frequencies, (b) the bit rate if modulation is done by using full duplex ASK with  $d = 1$ , and (c) the bit rate if modulation is done by using FSK with  $d=1$ . [3]

(ii) We need to send data 3 bits at a time at a bit rate of 3 Mbps. The carrier frequency is 10 MHz. Calculate the number of levels (different carrier frequencies), the baud rate, and the bandwidth. [2]

**Problem 02:** (i) Illustrate the constellations diagram of QPSK showing the phase and bit location. [2]

(ii) Compute the bandwidth for a signal transmitting at 12 Mbps using QPSK. The value of  $d = 0$ . [3]

**Problem 03:** A voice channel occupies a bandwidth of 4 kHz. We need to combine two voice channels into a link with a bandwidth of 12 kHz, from 18 to 30 kHz. Illustrate the configuration, using the frequency domain. Assume there are no guard bands. [5]

**Problem 04:** (i) Four digital data channels, each transmitting at 1 Mbps, use an analog satellite channel of 1 MHz. Design an appropriate configuration, using FDM. [3]

(ii) Five channels, each with a 100-kHz bandwidth, are to be multiplexed together using FDM. What is the minimum bandwidth of the link if there is a need for a guard band of 5 kHz between the channels to prevent inter-channel interference? [2]