



Strathmore  
UNIVERSITY

SCHOOL OF COMPUTING AND ENGINEERING SCIENCES  
BACHELOR OF COMPUTER NETWORKS AND CYBER SECURITY  
END OF SEMESTER EXAMINATION

CNS2105: VOICE AND DATA COMMUNICATION

DATE: 1<sup>st</sup> August 2024  
Hrs

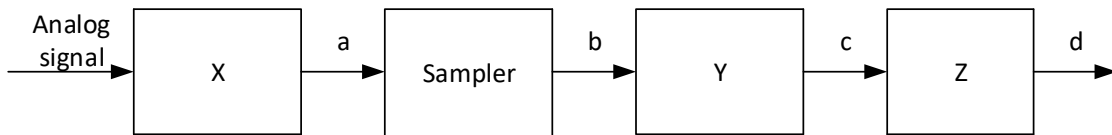
Time: 15:30-17:30

**Instructions**

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.

**QUESTION ONE (30 MARKS-COMPULSARY)**

- a) Distinguish between analogue and digital signals. (2 marks)
- b) Figure 1 shows a block diagram of a pulse code Modulation (PCM) transmitter



**Figure 1**

- i. Name blocks X,Y and Z ; (3marks)
- ii. State the function of the sampler; (1 mark)
- iii. Table 1 shows the labels of the signal types at points a, b ,c, and d and the signal types. Match the point to its signal type. (4marks)

**Table 1**

Points	Nature of the signal
a	Digital
b	Discrete in time and amplitude
c	Analog
d	Discrete in time

- c) State **two** reasons for the use of line codes in baseband signal transmission. (2 marks)
- d) State any **two** properties of Bi-phase line codes . (2 marks)



**QUESTION 3 (15 MARKS)**

- a) Explain the reason of converting digital data to analogue signal. **(2 marks)**
- b) Describe each of the following modulation schemes
- i. Amplitude shift Keying;
  - ii. Frequency shift Keying;
  - iii. Phase shift keying.
- (6 marks)**
- b) A carrier wave represented by  $10 \cos(2\pi 10^6 t) V$  is amplitude modulated by a second wave represented by  $3 \cos(2\pi 10^3 t) V$ . Calculate
- i. The depth of modulation;
  - ii. The upper and lower side frequencies;
  - iii. The amplitude of the side frequencies;
  - iv. The fraction of the power transmitted in the sidebands.

**(7 marks)**

**QUESTION 4 (15 MARKS)**

- a) Describe each of the following transmission impairments
- i. Attenuation;
  - ii. Delay distortion;
  - iii. Noise .
- (6 marks)**
- b) A communication channel with a SNR of 30dB is designed to transmit a binary signal at a transmission rate of  $R = 100 \text{ Mbps}$ . Calculate the minimum channel bandwidth required. **(6 marks)**
- c) For a given channel capacity, explain the trade-off between bandwidth and power transmitted . **(3 marks)**

**QUESTION 5 (15 marks)**

- a) Distinguish between peer to peer and client server-based VoIP signalling protocols. **(2 marks)**
- b) Table 2 shows comparison of VoIP protocols based on the standard body, vendor neutrality and architecture. Fill in the Table. **(6 marks)**
- | Protocol | Standards body | Vendor neutrality | Architecture |
|----------|----------------|-------------------|--------------|
| H.323    |                |                   | Peer-to-peer |
| MGCP     | IETF           |                   |              |
| SIP      |                | Basic             |              |
- c) State **three** challenges experienced in transmitting voice over packet switched networks. **(3 marks)**
- d) Describe each of the following components of a GSM network
- i. Home location register;
  - ii. Visitor location register;

**(4 marks)**