BINDURA UNIVERSITY OF SCIENCE EDICATION

FACULTY OF SCIENCE EDUCATION

DEPARTMENT OF ENGINEERINGAND PHYSICS

Bachelor of Science Honours Degree in Electronic Engineering

EEE 3105 - Communication Engineering Question Paper

JUN 2025

Time Allowed: 3 Hours **Total Marks:100**

Special Requirements: Scientific Calculator, rule, pen, pencil

INSTRUCTIONS

1. Answer any **FIVE (5) questions**

2. The question paper **contains SEVEN (7)** questions

2. Each question carries 20 marks

1(a)(i) State four effects of noise on operation of electronic communication systems [4]
(ii) Draw a well-labelled circuit diagram that can be used to derive thermal noise voltage [5]
(iii) Using the diagram in (ii) above show that thermal noise voltage $V_n = 2\sqrt{kTBR}$ [5]
(b) State any three enhanced telephone services [3]
(c) Discuss three reasons for modulation [3]

2(a)The signal that consists of three sinusoids having the following amplitudes and frequencies:
A_1 $15V$ and $f_1 = 9\ x\ 10^6\ Hz,\ A_2 = 50V\ and\ f_2 = 9.5\ x\ 10^6\ Hz,\ and\ A_3 = 30V\ and\ 11\ x\ 10^{6\ Hz}$:
(i)Depict its spectrum. [6]
(ii)What is the bandwidth of this signal? [2]
(iii) What transmission bandwidth do we need to deliver this signal? [3]
(b)Define three types of signals involved in the modulation process [3]
(c)Illustrate the relationship among the modulating signal, carrier signal and modulated signal using waveform diagrams with 50% modulation for AM. [6]

3(a)Discuss the following multiple access techniques with the aid of diagrams
(i)**Time** Division Multiple Access (TDMA) [4]
(ii)**Frequency** Division Multiplexing Access (FDMA) [4]
(b)Compare and contrast circuit switching and packet switching. [5]
(c)Briefly describe a LAN network. [2]
(d)Derive the expression for total power content in an AM signal. [5]

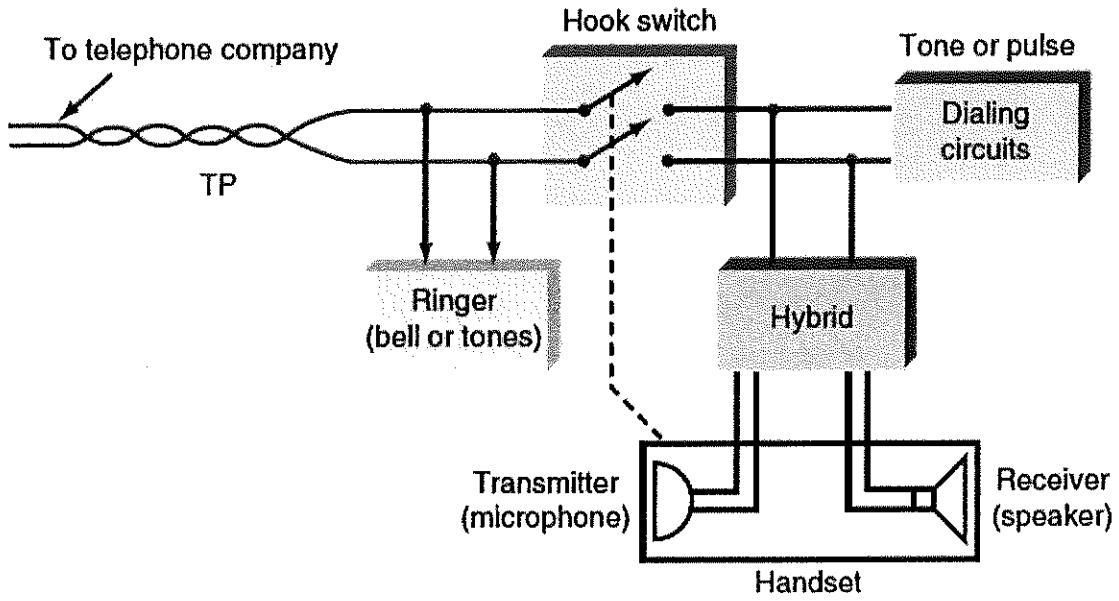
4(a)With the aid of a suitable diagram discuss the components of an analogue communication system. [8]
(b)Discuss the full duplex mode of communication with the aid of a suitable diagram [5]
(c)(i)Why are standards necessary in Telecommunication? [3]
(d)State four functions of Postal and Telecommunication Regulatory Authority of Zimbabwe(POTRAZ) organisation in Zimbabwe. [4]

5(a)Compare Analog systems and Digital systems [6]
(b)Illustrate the relationship among the modulating signal, carrier signal and modulated signal using waveform diagrams for FM. [6]
(c)Using one modulating signal illustrate the difference between AM and FM [6]
(d)A cell phone transmitter has a maximum frequency deviation of 12 kHz. Calculate the modulation index if it operates at maximum deviation with a voice frequency of 300 Hz. [2]

6(a)The FM radio link having a deviation ratio of 10 is to transmit a speech band up to 5 kHz. What RF bandwidth should be used. [2]
(b)A speech signal in a telephone system occupies frequency range of 300-3400 Hz (considered on a band). In a carrier system, it is transmitted as SSB signal. Calculate saving in the bandwidth, as compared to AM transmission. [3]
(c)An FM signal is represented by $v(t) = 10\sin(10^8 t + +15\sin 2000t)$. Find the parameters of the FM Wave. [4]

(d)State six functions of the telephone set two in receive mode and three in transmit mode? [5]

(c)The diagram below shows a basic telephone set.



Describe the functions of the following blocks

(i)Ringer [2]

(ii)Handset [2]

(iii)Dialling circuit [2]

7(a) List the 10 steps in a chronological order involved in completing a local telephone call between two subscribers connected to the same telephone switch. [10]

(b) Describe pulse dialling in Telephone systems. [2]

(c)Describe call forwarding telephone enhanced services

(d)(i)Derive the expression of an AM signal in the frequency domain. [5]

(ii)Discuss three distinct signals in the expression. [3]

The End