BINDURA UNIVERSITY OF SCINCE EDUCATION

FACULTY OF SCIENCE EDUCATION

DEPARTMENT OF ENGINEERING AND PHYSICS

Bachelor of Science Honours Degree in Electronic Engineering

EEE5205 - COMMUNICATION SYSTEMS

Duration: 3 Hours **Total Marks: 100**

Special Requirements: Non Programmable Scientific Calculator

INSTRUCTIONS

1. Answer any **FIVE (5)** questions
2. This paper contains **SEVEN (7)** questions
3. Each question carries 20 marks

1(a)For a customer to be connected to an ADSL network state four requirements that must be met. [4]

(b)Draw a block diagram of an ADSL reference model and describe the function of each block. [5+3]

(c)State four UTP impairments that affect ADSL signal [4]

(d)(i)State Shannon-Hartely Law [2]

(ii)Explain its significance [2]

2(a)With the aid a well labelled diagram explain GPON operation in the following directions using three ONUs/ONTs

(i)Upstream direction [7]

(ii)Downstream direction [8]

(b)State direction in which dynamic bandwidth allocation is implemented and why in that direction. [3]

(c) In GPON explain what you understand by ranging. Explain is significance. [2]

3(a)When the mean optical power launched into an 8 km length of fiber is 120 μW, the mean optical power at the fiber output is 3 μW. *Determine*:

(i)The overall signal attenuation or loss in decibels through the fiber assuming there are no connectors or splices; [2]

(ii) the signal attenuation per kilometre for the fibre. [2]

(iii) the overall signal attenuation for a 10 km optical link using the same fiber with splices [2]

(iv)a numerical value for the input/output power ratio [2]

(b)State two advantages of optical fibre communication system [3]

(c)Consider a light ray traveling from a denser (i.e., higher refractive index, $n_1 = 1.5$) material into a less dense (lower refractive index, $n_2 = 1.47$) material. Show that the desired criterion of total internal reflection phenomenon is completely satisfied. [3]

(d)There are several light losses which may occur during transmission of light signal inside the fibre. State two types of losses. [2]

(e)There are basically three types of optic fibre. State the types of classes [3]

(f)State one advantage of injection laser diode over light emitting diode [1]

4(a)State three features of satellite communication. [3]

(b)(i)Why is C band the band of choice to a customer who needs to use satellite Communication system. [2]

(ii)Discuss its disadvantage [2]

(c)Why do all geostationary satellites orbit the earth at the same distance and above the equator? [1]

(d)State two advantages of satellite communication. [2]

(e)Discuss TDMA application in satellite communication [2]

(f) With the aid of well labelled diagram, explain the operation of satellite communication systems. [6]

(g)State two typical applications of satellite communication [2]

5(a) State three features of microwaves. [3]

(b) Discuss one advantage of using microwaves [2]

(c) Briefly explain two applications of microwaves. [4]

(d)Mention two types of antennas that can be used in Microwave communication.[2]

(e) Discuss any two main applications of microwaves [3+3]

(h)The table below shows IEEE frequency band designations. Fill in correction values of A, B and C. [3]

	Letter band designator	Frequency range (GHz)
Microwave Region	L	1 to 2
	S	A
	B	4 to 8
	X	8 to 12
	C	12 to 18
	K	18 to 26
	K_a	27 to 40
Millimeter wave Region	V	40 to 75
	W	75 to 110
	Millimeter waves	30 to 300
	Submillimeter waves	300 to 3000

6(a) A telephone line normally has a bandwidth of 3000 Hz (300 to 3300 Hz) assigned for data communications. The signal-to-noise ratio is usually 3162. For this channel, calculate the capacity. [3]

(b) With the aid diagrams briefly explain the following line coding techniques.

(i)Unipolar Non-Return-to-Zero (NRZ) [3]

(ii)Polar Non-Return-to-Zero (NRZ) [3]

(iii)Return to Zero(RZ) [3]

(c) State five characteristics of line coding techniques. [5]

(d) Write the ASCII code for the word 'HELLO' using even parity by filling in the parity bit at eighth bit position in figure below. [3]

7(a) With the aid of block diagrams where possible, explain the following TV applications.

(i) Closed Circuit Television (CCTV) [4]

(ii)Satellite TV [4]

(b) The scanning in camera and scanning in the picture tube should be *synchronised*. What does that mean. [2]

(c) What is the effect of not having synchronization between the scanning in the camera and scanning in the TV receiver. [2]

(d) Explain why FM is preferred for sound transmission in TV channels and why AM is preferred for video transmission. [3]

(e) With the aid of a suitable diagram, explain Vestigial Sideband Transmission (VSB)[5]

THE END