BINDURA UNIVERSITY OF SCIENCE EDICATION

FACULTY OF SCIENCE EDUCATION

DEPARTMENT OF ENGINEERINGAND PHYSICS

Bachelor of Science Honours Degree in Electronic Engineering

EEN5205 - Communication Systems

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)State two conditions that must be satisfied for Total Internal Reflection to occur inside the Optic fibre cable. [2]

(b)A silica optical fibre has a core refractive index of 1.50 and a cladding refractive index of 1.46. Determine:

(i) Critical angle at the core-cladding interface [2]

(ii) Numerical aperture for the fibre [2]

(c) Compare and contrast step-index and graded index optic fibres [6]

(d) Explain any three attractive features of optic fibre communication. [6]

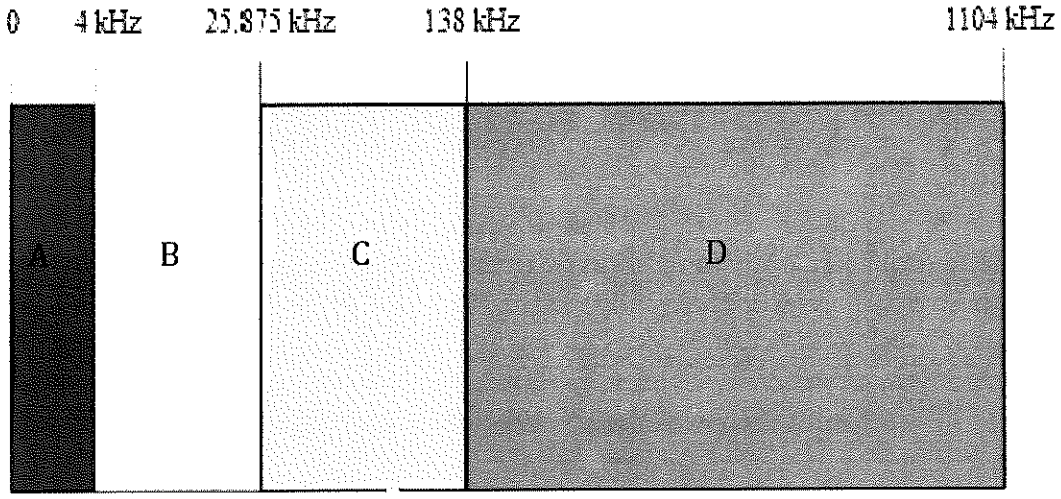
(e) An optical source radiates 2 mW power. Compute the power level (in mW) at the input of optical receiver if the system losses accumulate to 23 dB. [2]

2(a) State four factors that affect ADSL speed. [4]

(b) What are requirements for a customer to be connected to TelOne ADSL network? [3]

(c) Figure below shows ADSL splitter functionality. Name devices labelled A to E and give their respective functions. [10]

(d) Figure below shows frequency spectrum of a UTP carrying an ADSL signal. Four channels are labelled A to D. Use this to answer questions (i) to (iii)



(i) Which is the fastest channel. Give its proper name. [1]

(ii) What is the actual name for channel labelled B. Give its function. [1]

(iii) What is the name channel labelled A. State is function. [1]

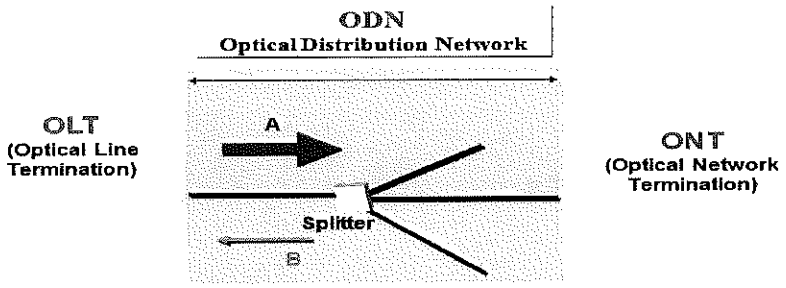
3(a) Power splitting is a technique used in GPON technology. State its two advantages. [2]

(b) Give one disadvantage of high split ratio. [1]

(c) Calculate loss incurred on a 1:64 splitter [2]

(d) With the aid of a well labelled diagram explain GPON operation principles in the downstream direction. [5]

(e) Figure below shows a GPON network. Use figure below to answer (i), (ii), (iii) below.



(i) State transmission modes that are used in direction A and B. [2]

(ii) State wavelengths that are used in direction A and B. [2]

(iii) In which direction do we implement Dynamic Bandwidth Assignment and why. [2]

(iv) Direction A and B have important names. Give the respective names of each. [2]

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

4(a) What are the advantages of satellite communication over optical fibre communication. [5]

(b) In Zimbabwe rural areas VSAT can be used to access internet faster than wired any wired communication systems like ADSL or GPON. Give advantages of VSAT Technology. [5]

(c) With the aid of a well-labelled diagram explain the operation of a communication satellite. [5]

(d) Most new satellites are now operating in KU band. Explain this movement from the popular C band. [2]

(e) How is a satellite kept in orbit? Explain the balancing forces. [3]

5(a) State in the chronological order five basic steps that are involved in the design Of a microwave communication link. [5]

(b) Using a suitable block diagram, illustrate the movement of a signal through a microwave relay system. [8]

(c) Briefly explain any three functions of microwaves [6]

(d) Microwave communication uses antennas. State any one antenna property. [1]

6(a) Draw a block diagram data communication systems between two points using an appropriate seven-part data circuit. [5]

(b) Write the ASCII code for the word 'HELLO' using odd parity by filling in the

parity bit at eighth bit position in figure below. [3]

	8	7	6	5	4	3	2	1	Bit positions*
H	1	0	0	1	0	0	0		
E	1	0	0	0	1	0	1		
L	1	0	0	1	1	0	0		
L	1	0	0	1	1	0	0		
O	1	0	0	1	1	1	1		

* The parity bit is at eighth bit position.

(c) Calculate maximum bit rate of a noiseless channel transmitting a signal with four levels (for each level, we send 2 bits). [2]

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

(i)Non-Return-to-Zero Level(NRZ-L) [2]

(ii)Polar Non-Return-to-Zero inverted (NRZ-I) [2]

(iii)Diphase code [2]

(e) Differentiate with the aid of diagram two circuit configurations that you studied. [4]

7(a) Draw a basic block diagram of a monochrome television transmitter and explain how it operates. [10]

(b) Draw a basic block diagram of a basic monochrome television receiver and explain how it operates. [10]

The End