TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING
UNIVERSITY EXAMINATIONS FOR DIPLOMA IN TECHNOLOGY (ELECTRICAL & ELECTRONIC ENGINEERING)

ETI 2201

DATA COMMUNICATIONS I

END OF SEMESTER EXAMINATION

SERIES: AUGUST 2019

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination
-Answer Booklet, examination pass and student ID
This paper consists of **five** Questions
Attempt any THREE Questions.
Do not write on the question paper.

QUESTION ONE

a) i) Draw a block diagram of a data communication system and Explain its operation
ii) State the functions of the Universal Asynchronous Receiver Transmitter (UART) (8 marks)

b) Explain the role of the following standard organizations and give an example of a standard developed by each of them and its application
i) ISO IEEE ii) IEEE (6 marks)

c) Explain any TWO the functions of each of the following layers of the OSI model;
i) physical layer ii) Data link layer iii)Network layer (6 marks)

d) Describe the term protocol as applied in data communication and Explain the key elements of a protocol (2 marks)

QUESTION TWO

a) i) Define the term **data transparency** and state how it is achieved in character oriented transmission schemes

ii) Distinguish between asynchronous and synchronous transmission and give an application of each (8 marks)

b) Explain how the bit and frame synchronization are implemented in the following transmission control schemes

i) Character oriented

i) Bit oriented schemes (4 marks)

c) i) Use figure 2.3 (ASCII code) to encode the following characters

I) 2 II) X III) @ IV) ACK

ii) Decode the following ASCII message

1010011 1001001 1010100 (4 marks)

Bits	5	0	1	0	1	0	1	0	1
	6	0	0	1	1	0	0	1	1
1 2 3 4	7	0	0	0	0	1	1	1	1
0 0 0 0		NUL	DLE	SP	0	@	P	`	p
1 0 0 0		SOH	DC1	!	1	A	Q	a	q
0 1 0 0		STX	DC2	"	2	B	R	b	r
1 1 0 0		ETX	DC3	#	3	C	S	c	s
0 0 1 0		EOT	DC4	$	4	D	T	d	t
1 0 1 0		ENQ	NAK	%	5	E	U	e	u
0 1 1 0		ACK	SYN	&	6	F	V	f	v
1 1 1 0		BEL	ETB	'	7	G	›W	g	w
0 0 0 1		BS	CAN	(	8	H	X	h	x
1 0 0 1		HT	EM	)	9	I	Y	i	y
0 1 0 1		LF	SUB	*	:	J	Z	j	z
1 1 0 1		VT	ESC	+	;	K	[	k	{
0 0 1 1		FF	FS	,	<	L	\	l	|
1 0 1 1		CR	GS	-	=	M	]	m	}
0 1 1 1		SO	RS	.	>	N	^	n	~
1 1 1 1		SI	US	/	?	O	–	o	DEL

Figure 2.3 Seven-bit American standard

d) A message comprising one hundred and twenty 8- bit characters is to be transmitted over a data link ,Determine the total number of redundant bits required when using;

i) Asynchronous transmission control scheme with one start bit and two stop bits per character and single start of frame and single end of frame character per message.

ii) Synchronous transmission control scheme employing two SYN control characters and a single Start of frame (STX) and single end of frame (ETX) character per message (4 marks)

QUESTION THREE

a) Explain any THREE factors that influence the choice of a line code scheme for data communication (6marks)

b) i) Encode the bit stream 0001100111 using each of the following line codes

I) Manchester II) differential Manchester III) AMI

ii) State any ONE application of each one of the line codes in b (i) (9marks)

c) i) Explain the term violations as applied in line coding

ii) State any TWO advantages of the biphase coding schemes

iii) Decode the B8ZS encoded signal shown in figure 1 (5marks)

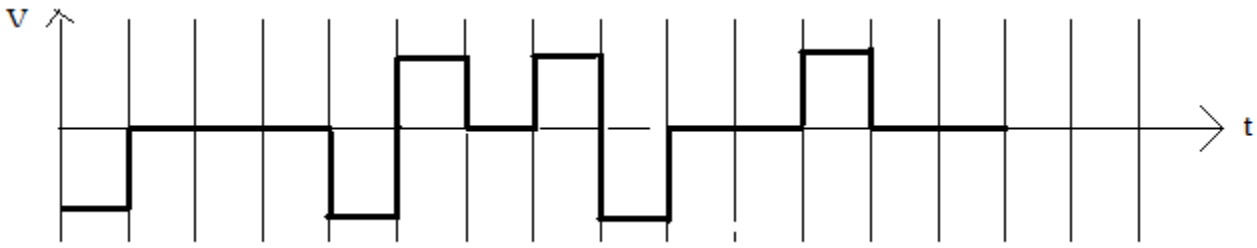

figure 1

(3 marks)

QUESTION FOUR

a) With the aid of sketches , describe the following digital modulation methods

i) ASK ii) BFSK (4 marks)

Assume the data signal is given by 0110001

b) i) Distinguish between phase coherent and phase differential PSK modulations

ii) Explain any TWO advantages of PSK

iii) draw the constellation diagram of 16-QAM (3 amplitudes ,12 phases) (6marks)

c) Draw a circuit diagram of BFSK modulator and Explain its operation (8 marks)

d) An FSK signal is transmitting at 36000 bps using full duplex mode ,determine the bandwidth required per channel given that the two carriers are separated by 1600 Hz

(2marks)

QUESTION FIVE

a) i) With the aid of a construction diagram, explain the functions of the main components of a fiber optic cable

ii) List any FOUR advantages of fiber optic cables (10marks)

b) With the aid of sketches, Describe the following types of optical fibers

i) stepped index ii) graded index (6marks)

c) It is required to transmit a 100MHz analogue signal over an optical fiber link of length 5km.The input power is 3dBm at the source and the output received power is -20dBm.

The following losses are given;

Reflection loss = 0.35dB

Numerical aperture loss = 12dB

Safety Margin = 1.5dB

Output coupling losses = 0.5dB

Calculate

i) attenuation loss of fibre

ii) allowable loss per km of the cable (4 marks)