

**ETL - Telecommunication** WORKFORCE DEVELOPMENT AUTHORITY

**Systems**

**T104**

**Thursday, 07/11/2013**

**8:30 - 11:30 AM**



P.O.BOX 2707 Kigali, Rwanda Tel: (+250) 255113365

---

**ADVANCED LEVEL NATIONAL EXAMINATIONS, 2013;  
TECHNICAL AND PROFESSIONAL TRADES**

**EXAM TITLE: Telecommunication Systems**

**OPTION: Electronics and Telecommunication (ETL)**

**DURATION: 3hours**

**INSTRUCTIONS:**

The paper is contains Three **(3)** Sections:





**Section I:** Fifteen **(15)** questions, all **Compulsory**. **55marks**

**Section II:** Five **(5)** questions, **Choose any Three (3)**. **30marks**

**Section III:** Two **(2)** questions, **choose any one (1)**. **15marks**

**Section I: Attempt all the 15 questions.****55marks**

01. Describe the bandwidth of an antenna. **1mark**
02. What is a good way to get maximum performance from a Yagi antenna? **2marks**
03. Identify two types of Omni-directional antennas. **2marks**
04. Describe the characteristics of F region of Ionosphere. **2marks**
05. Identify two operations or steps involved in transformation of analog signal into digital signal for a digital communication system. **2marks**
06. The power of a transmitter is increased from 5 watts to 50 watts by a linear amplifier; express the power gain in dB. **3marks**
07. Describe briefly a waveguide. **3marks**
08. For each form of signal represented bellow, identify which parameters are modified. **4marks**

	Signal
a)	
b)	
c)	
d)	

09. Identify in order of signal processing the main elements of FM radio receiver. **4marks**
10. Assume A, P be carrier amplitude and power of message respectively. Express the transmitted power in case of each of the following modulation or demodulation format. **4marks**
- a) AM coherent detection      b) DSB-SC coherent detection
- c) SSB coherent detection      d) Am envelope detection
11. Describe the expression of instantaneous frequency in frequency modulation type. **5marks**
12. Identify five basic factors with which the television system must deal for successful transmission and reception of pictures. **5marks**

13. Identify the basic elements involved in communication system to transfer information from one point to another and precise the role of each element.

6marks

14. Identify six (6) among the general functions performed by a digital communications receiver.

6marks

15. Identify six basics parameters that should be considered and measured during the designing process of an antenna.

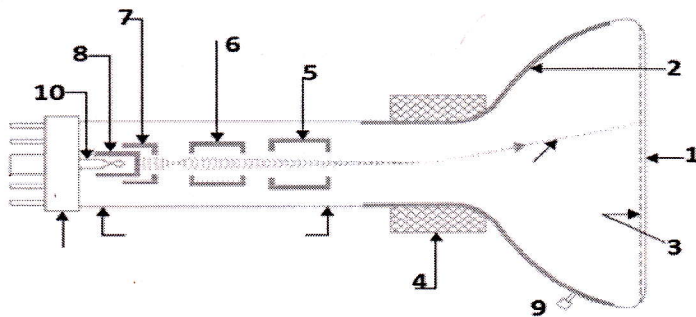
6marks

**Section II: Attempt any three (3) questions.**

**30marks**

16. Identify different elements of a television picture tube represented by numbers (1, 2, 3, 4, 5, 6, 7, 8, 9 and 10) on the following diagram.

10marks



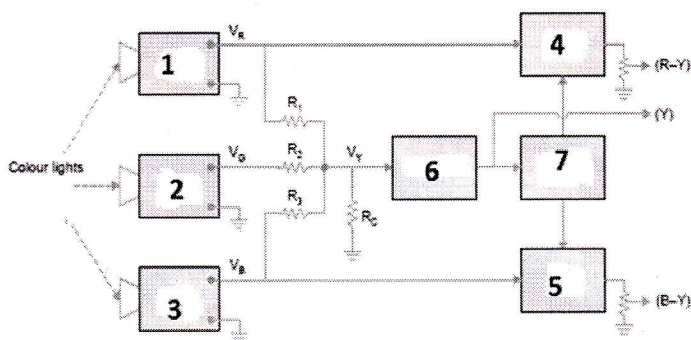
17. a) Identify seven (7) functions that can be controlled on a remote control of a color television receiver.

7marks

b) What are the basic elements of a television receiver remote control? 3marks

18. Complete the following diagram by finding the function that corresponds to the number (1, 2, 3, 4, 5, 6 and 7) and determine mathematical expression of R-Y; B-Y and Y.

10marks



19. An AM wave is represented by the expression:  $v = 5(1+0.6\cos 6280t) \sin 221 \times 10^4 t$  volts

(i) What are the maximum and minimum amplitudes of the AM wave?

(ii) What frequency components are contained in the modulated wave?

10marks

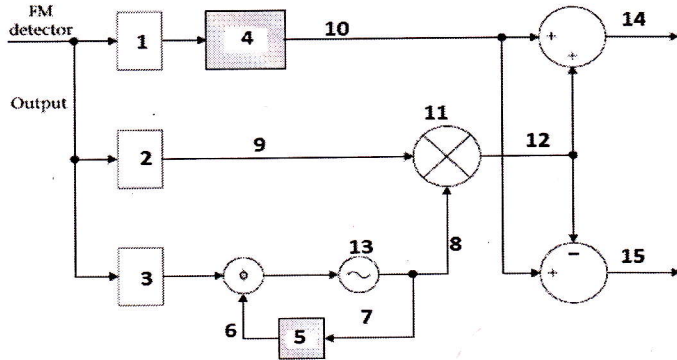
20. Total internal reflection is the back bone of optical communication. Explain and add diagram if possible.

10marks

**Section III: Choose and Answer any one (1) question.**

**15marks**

**21.**The following is a typical stereo demodulator block diagram; determine what is corresponding to each number (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15) in the diagram. It is not necessary to draw the diagram. **15marks**



**22.**An FM transmitter has an output power of 10W. Determine the power in the various frequency components of the signal if the index of modulation is 1.0. Use the table below for more information. **15marks**

x	Bessel-function order, n																
	$J_0$	$J_1$	$J_2$	$J_3$	$J_4$	$J_5$	$J_6$	$J_7$	$J_8$	$J_9$	$J_{10}$	$J_{11}$	$J_{12}$	$J_{13}$	$J_{14}$	$J_{15}$	$J_{16}$
0.00	1.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.25	0.98	0.12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.5	0.94	0.24	0.03	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.0	0.77	0.44	0.11	0.02	—	—	—	—	—	—	—	—	—	—	—	—	—
1.5	0.51	0.56	0.23	0.06	0.01	—	—	—	—	—	—	—	—	—	—	—	—
2.0	0.22	0.58	0.35	0.13	0.03	—	—	—	—	—	—	—	—	—	—	—	—
2.41	0	0.52	0.43	0.20	0.06	0.02	—	—	—	—	—	—	—	—	—	—	—
2.5	-0.05	0.50	0.45	0.22	0.07	0.02	0.01	—	—	—	—	—	—	—	—	—	—
3.0	-0.26	0.34	0.49	0.31	0.13	0.04	0.01	—	—	—	—	—	—	—	—	—	—
4.0	-0.40	-0.07	0.36	0.43	0.28	0.13	0.05	0.02	—	—	—	—	—	—	—	—	—
5.0	-0.18	-0.33	0.05	0.36	0.39	0.26	0.13	0.05	0.02	—	—	—	—	—	—	—	—
5.53	0	-0.34	-0.13	0.25	0.40	0.32	0.19	0.09	0.03	0.01	—	—	—	—	—	—	—
6.0	0.15	-0.28	-0.24	0.11	0.36	0.36	0.25	0.13	0.06	0.02	—	—	—	—	—	—	—
7.0	0.30	0.00	-0.30	-0.17	0.16	0.35	0.34	0.23	0.13	0.06	0.02	—	—	—	—	—	—
8.0	0.17	0.23	-0.11	-0.29	-0.10	0.19	0.34	0.32	0.22	0.13	0.06	0.03	—	—	—	—	—
8.65	0	0.27	0.06	-0.24	-0.23	0.03	0.26	0.34	0.28	0.18	0.10	0.05	0.02	—	—	—	—
9.0	-0.09	0.25	0.14	-0.18	-0.27	-0.06	0.20	0.33	0.31	0.21	0.12	0.06	0.03	0.01	—	—	—
10.0	-0.25	0.04	0.25	0.06	-0.22	-0.23	-0.01	0.22	0.32	0.29	0.21	0.12	0.06	0.03	0.01	—	—
12.0	0.05	-0.22	-0.08	0.20	0.18	-0.07	-0.24	-0.17	0.05	0.23	0.30	0.27	0.20	0.12	0.07	0.03	0.01

“Table of Bessel Functions”