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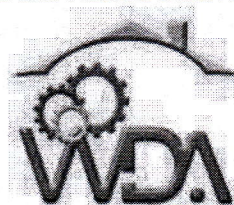
P.O. BOX 2707 Kigali, Rwanda Tel: (+250) 255113365

ADVANCED LEVEL NATIONAL EXAMINATIONS, 2015, TECHNICAL AND PROFESSIONAL TRADES

EXAM TITLE: Telecommunication Systems

OPTION: Electronics and Telecommunication (ETL)

DURATION: 3hours

INSTRUCTIONS:

The paper is composed of **three (3) Sections**:

Section **I**. Nineteen **(19)** questions, all **compulsory.**   **55marks**

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

Section **III**. Three (3) questions, **Choose only one (1).**   **15marks**

Every candidate is required to strictly obey the above instructions. Punishment measures will be applied to anyone who ignores these instructions.

Section I. Nineteen (19) Compulsory questions.   55marks

01. What is the role of microphone and earphone in telephone system?   **2marks**

02. What are the two inseparable field components of electromagnetic waves?

     2marks

03. List out three major properties of electromagnetic waves.   **3marks**

04. Complete the label of the Polar diagram for a yagi antenna shown below.
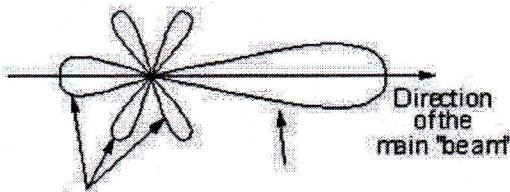
     2marks

05. Most antennas and electromagnetic waves have two types of polarization.
List them.   **2marks**

06. What is the transmission medium for sound?   **2marks**

07. Telephone is a duplex communications medium, what does mean?   **2marks**

08. What are the four basic media for information transfer from one point to
another in transmission systems?   **4marks**

09. Show the main elements of a communication system using block diagram.

     4marks

10. What are the main three phases of PCM encoding (A/D conversion)?   **3marks**

11. Differentiate half duplex from full-duplex.   **4marks**

12. What is modulation?   **3marks**

13. What are the four kinds of Amplitude Modulation techniques?   **4marks**

14. Determine the developed three different types of colour picture tubes.   **3marks**

15. How are the complementary colours in television colours produced?   **4marks**

16. What are the basic wave propagation modes in radio communication?   **3marks**

17. Describe the three compatible colour television systems.   **3marks**

18. Identify the modulation techniques used in analog television
transmissions for sound and video signals   **3marks**

19. What are the factors that affect the propagation of radio waves?   **2marks**

Section II. Answer any three (3) questions of your choice

(Do not choose more than <u>three questions</u>).   30marks

20. What are the advantages of FM over AM? What four basic functions must a receiver perform?   **10marks**

21. Explain in detail about BPSK, QPSK, FSK and 8 phases PSK.   **10marks**

22. Draw the push button keypad of Dual Tone Multi Frequency (DTMF) and explain what is DTMF signalling.   **10marks**

23. The PAL TV system uses 625 interlaced scan lines occurring at a rate of 25 frames per second. The horizontal scanning rate is 15,625 Hz. About 80 percent of one complete horizontal scan is devoted to the displayed video, and 20 percent to the horizontal blanking. Assume that the horizontal resolution R_H is about 512 lines. Only about 580 horizontal scan lines are displayed on the screen. Calculate the bandwidth of the system and the vertical resolution R_V.

     10marks

24. a) An FM signal has a resting frequency of 105MHz and highest frequency of 105.03 MHz when modulated by a signal of frequency 5Khz, Determine:

   i. Frequency deviation,

   ii. Carrier suing,

   iii. Modulation index

   iv. Percent modulation

   v. Lowest frequency reached by the FM wave.   **10marks**

   b) Identify and explain in order of signal processing the main elements of super heterodyne receiver.   **10marks**

Section III. Answer any one (1) question of your choice
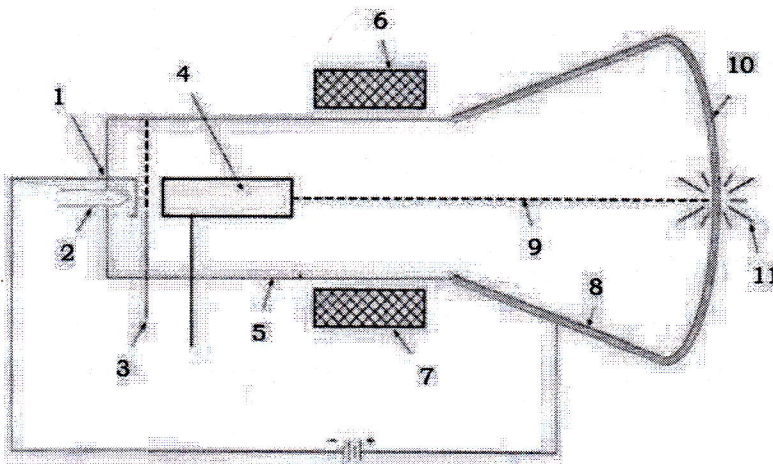
(Do not choose more than <u>one question</u>).   15marks

25. With a net block diagram, explain all the elements of the fiber optic communication system and their roles.   **15marks**

26. a) Identify different elements of a television picture tube (monochrome cathode-ray tube) represented by numbers (1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11) on the following diagram.

11marks

b) List the fundamental components of a DVD player.   **4marks**

27. A frequency modulated voltage wave is given by the equation:

e = 12cos (6 × 108t + 5 sin 1250 t).

Find

(i)   carrier frequency

(ii) signal frequency

(iii) modulation index

(iv) maximum frequency deviation

(v)   power dissipated by the FM wave in 10-ohm resistor.   **15marks**