ETL – Telecommunication Systems

T008

Tuesday, 27/11/2018

08:30 – 11:30 AM

WORKFORCE DEVELOPMENT AUTHORITY

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

ADVANCED LEVEL NATIONAL EXAMINATIONS, 2018, TECHNICAL AND PROFESSIONAL STUDIES

EXAM TITLE: TELECOMMUNICATION SYSTEMS

OPTION: Electronics and Telecommunication (ETL)

DURATION: 3 hours

INSTRUCTIONS:

The paper is composed of **the following sections**:

Section I: Sixteen (16) compulsory questions.	**55 marks**
Section II: Attempt **any three (3)** out of five questions.	**30 marks**
Section III: Attempt **any one (1)** out of three questions.	**15 marks**

Note:

Every candidate is required to carefully comply with the above instructions. Penalty measures will be applied on their strict consideration.

Section I. Sixteen (16) Compulsory questions **55 marks**

01. What are the three basic units of a communication system? **(3 marks)**

02. Discuss the advantage of FDM over TDM? **(5 marks)**

03. What type of modulation is required for television broadcast? **(2 marks)**

04. What is a MODEM? **(3 marks)**

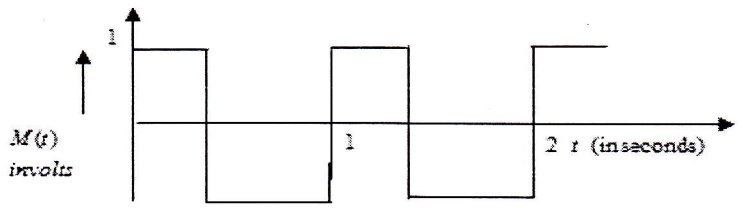
05. Why short wave-bands are used for long distance broadcating? **(2 marks)**

06. Name the type of radio wave propagation involved when TV signals, broadcasted by a tall antena are intercepted directly by the receiver antena. **(2 marks)**

07. Give any three differences between Fax and E mail systems of communication. **(3 marks)**

08. What is the purpose of modulating signal in transmission? **(6 marks)**

09. A modulating signal is a square wave as shown in figure below:



c (t) = 2 sin (8πt) volts

(i) What is the frequency of the carrier?

(ii) What is the modulation index? **(4 marks)**

10. Distinguish between point to point and broadcast communication modes and give one example for each mode. **(4 marks)**

11. What should be the length of dipole antena for a carrier wave of frequency 600Mhz ? **(3 marks)**

12. A message has a bandwidth of 5 Mhz. Suggest a possible communicationcation channel for its transmission. **(2 marks)**

13. Differentiate transmitting antenna from receiving antenna. **(4 marks)**

14. A Carrier wave of peak voltage 20 V is used to transmit a message signal. What should be the peak voltage of the modulatig signal in order to have a modulation index of 80%? **(3 marks)**

15. Write down six types of antennas according to their physical structures. **(6 marks)**

16. Briefly explain the Sky Wave Propagation mode. **(3 marks)**

Section II. Choose and answer any three (3) questions **30 marks**

17. Suppose that on an AM signal, the $V_{max(p\_p)}$ value read from the graticule on the oscilloscope screen is 5.9 divisions and $V_{min\ (p\_p)}$ is 1.2 divisions.

a) What is the modulation index?

b) Calculate V_c, V_m, and *m* if the vertical scale is 2 V per division.

(10 marks)

18. An AM transmitter has a carrier power of 30 W. The percentage of modulation is 85 percent. Calculate:

(*a*) the total power

(*b*) the power in one sideband. **(10 marks)**

19. The European 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:

a) The bandwidth of the system

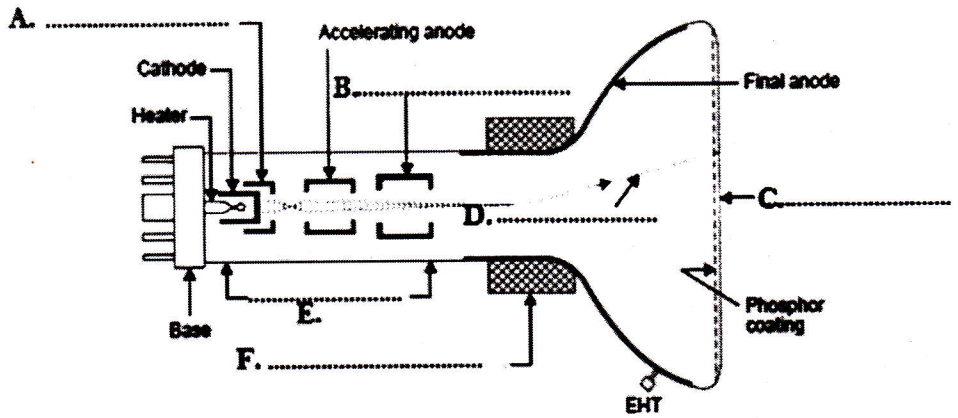
b) The vertical resolution. **(10 marks)**

20. An FM signal has a resting frequency of 105 MHz and highest frequency of 105.03 MHz when modulated by a signal of frequency 5 kHz. Determine:

(i) frequency deviation,
(ii) carrier swing,
(iii) modulation index,
(iv) percent modulation
(v) Lowest frequency reached by the FM wave. **(10 marks)**

21. A. Compute the picture and sound carrier frequencies for UHF TV channel 39 (extends from 620 to 626 MHz).

B. From the given elements of a picture tube, fill the names missing on indicated place (A, B, C, D, E and F).



15500

(10 marks)

Section III. Choose and answer any one (1) question **15 marks**

---

22. Discuss the aspects of Space Wave Propagation. **(15 marks)**

23. Differentiate resonnant antennas from non-resonant antennas. **(15 marks)**

24. Rwanda has developed a strong Information and Communication Technology policy. In this area, optical fiber has been introduced in different areas of the country. Clarify the practicality of optical fiber transmission, and discuss the advantages that Rwandans expect from optical fiber transmission. **(15 marks)**
