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. 55 marks

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

02. What are the two inseparable field components of electromagnetic waves? 2 marks

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

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

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

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

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

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

09. Show the main elements of a communication system using block diagram. 4 marks

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

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

12. What is modulation? 3 marks

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

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

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

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

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

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

19. What are the factors that affect the propagation of radio waves? 2 marks
Section II. Answer any three (3) questions of your choice
(Do not choose more than three questions). 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 swing,
   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 one question).  15 marks

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

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.

11 marks

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

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.  
15 marks