FIJI NATIONAL UNIVERSITY

SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING

FINAL EXAMINATION PAPER-PENSTER 3 2014

CERTIFICATE IV IN ELECTRONICS ENGINEERING

EEE424: RADIO RECEIVERS AND TRANSMITTERS

DURATION: 2 HOURS

INSTRUCTIONS TO STUDENTS:

1. You are allowed 10 minutes Extra reading time during which are **not to write**.
2. There are Four (4) sections in this examination paper, **ATTEMPT ALL QUESTIONS**
3. Begin each question on a **fresh page and use both sides of the sheet**.
4. Write your **ID. Number** at the top of each page of your answer booklet and any other attached sheets.
5. Insert all written foolscaps, graph paper, drawing paper etc. in their correct sequence and secure with strings.
6. For all sheets of paper on which rough/ draft work has been done, cross it through and **you must attach** to your answer scripts.
7. Clearly write the number(s) of the questions(s) you attempted on top of the sheet.
8. Answers to all questions must be **written in ink** on the answer sheets.
9. Calculators with **formula programmable functions** are **Not allowed**.

SECTION A **MULTIPLE CHOICE** **(20 MARKS)**

1. What is the IF of the AM receiver?
   a) 10.6 MHz
   b) 455 KHz
   c) 454 KHz
   d) 10.8 MHz

2. To remove one AM sideband and leave the other you could use
   a) A mechanical filter
   b) A crystal filter
   c) Both of these
   d) One of these

3. A directive antenna is
   a) A dipole aerial
   b) A Marconi aerial
   c) A yagi-uda aerial
   d) A whip aerial

4. Which stage comes after the mixer stage in an AM receiver?
   a) IF stage
   b) AGC stage
   c) Detector stage
   d) RF amplifier stage

5. FM receiver uses the standard frequency band of 88 to 108 MHz. What is the usual IF of these receivers?
   a) 10.6 MHz
   b) 10.7 MHz
   c) 10.8 MHz
   d) 10.9 MHz

6. The frequency stability of a phase locked loop oscillator depends on a
   a) Well regulated power supply
   b) Crystal control oscillator
   c) Voltage control oscillator
   d) High L/C ratio final stage

7. Which type of filter is commonly used in the antenna feed to prevent spurious radiation at the VHF base repeater site?

a) High pass filter
b) Band-pass filter
c) Band-stop filter
d) Low pass filter

8. SAW device may be used as:

a) Oscillators
b) UHF amplifiers
c) Filters Transmission
d) Media like strip line

9. For an AM receiver with an RF frequency of 558 kHz, what will the LO frequency be?

a) 1012 KHz
b) 1.013 MHz
c) 11.358 MHz
d) None of the above

10. Automatic gain and level control is most likely to be found in the

a) Superhet AM receiver
b) Superher FM receiver
c) Superhet AM transmitter
d) Superher FM transmitter

11. Choose the appropriate antenna used in all CB radios

a) Yagi-uda aerial
b) Marconi aerial
c) Dipole aerial
d) Stingers

12. The difference between the DC power into a transmitter and the RF power coming out:

a) Is a measure of efficiency?
b) Heats the transmitter
c) May require water cooling
d) All of the above

13. In an AM transmitter, ALC is used to

a) Keep the modulation closed to 100%
b) Keep the modulation below 100%
c) Maximize transmitter power
d) All of these

14. An indirect FM modulator:
    a) Requires a varactor in the carrier oscillator
    b) varies the phase of the carrier oscillator
    c) Both of these
    d) None of these.

15. The Superhet receiver was invented by:
    a) Foster
    b) Seeley
    c) Armstrong
    d) Hertz

16. The frequency of the local oscillator:
    a) Is above the RF frequency
    b) Is below the RF frequency
    c) c) Can be either above or below the RF frequency
    d) Is fixed, typically at 455 KHz

17. A varactor diode is also known as
    a) Snap-off varactor
    b) Voltage variable capacitor diode
    c) Rectifier diode
    d) Tunnel diode

18. Power amplifiers must be linear for any signal that
    a) Is complex
    b) Has variable amplitude
    c) Has variable frequency
    d) All of the above

19. ALC stands for:
    a) Amplitude level control
    b) Automatic level control
    c) Accurate level control
    d) None of the above

20. With the mixing process:
    a) The frequency can be raised
    b) The carrier frequency can be lower
    c) The carrier frequency can be changed to any required value
    d) The deviation is altered

SECTION B TRUE AND FALSE (10 MARKS)

1	Low pass filter is found in the detector stage of the radio receiver	
2	Power meter measures the forward and reflected power of a transmitter	
3	Feeders are the coaxial cables found in the transmitter site	
4	AFC is a device that maintains the frequency of an oscillator within the specified limits with respect to a reference frequency.	
5	Ganged capacitor is found in RF and LO stages	
6	Varactor uses a PN junction in reverse bias and has a structure such that the capacitance of diode varies with the reverse voltage	
7	Aerial coupling unit is usually found between an AM transmitter and the Marconi antenna	
8	Band pass filter is usually found with the FM transmitter and antenna	
9	Inductors are typically tuned by moving a ferrite core into or out of the coil and this is known as slug tuning	
10	The frequency of an LC oscillator can be changed by varying or tuning either the inductive or the capacitive element in a tuned circuit.	

SECTION C SHORT ANSWER QUESTION (20 MARKS)

Briefly give answers to these terminologies?

1. (i) Describe the electronic circuit called Limiters? (2marks)
   (ii) Specify its function as used in a FM radio receiver and state the reason? (3marks)

2. (i) Define the electronic circuit called the AGC? (2marks)

   (ii) Specify how AGC is obtained in a radio receiver? (3marks)

3. Define the following terms:-
   (i) AFC (1mark)
   (ii) Dipole (1mark)
   (iii) AFT (1mark)
   (iv) VCO (1mark)
   (iv) Impedance (1mark)

4. Sketch the function of the following:
   (i) The two transducers in a radio transmitter station. (2marks)
   (ii) The two transducers in a radio receiver. (1mark)
   (iii) The input to the radio transmitter subsystem (1mark)
   (iv) The output of the radio transmitter subsystem. (1mark)

SECTION D **LONG ANSWER QUESTIONS** **(50 MARKS)**

QUESTION ONE

1. Sketch a block diagram of an AM transmitter and clearly label each block? (10 marks)

2. At the output of each block of the AM transmitter drawn, sketch the waveform obtained after each process in the block? (8 marks)

3. Determine the transducers used here if any? (2 marks)

QUESTION TWO

1. Sketch and label clearly a block diagram of an FM transmitter? (10 marks)

2. At the output of each stage in the RF section only make a sketch of the waveform being produced? (5 marks)

QUESTION THREE

1. Specify the differences between the following terms:

    a) Frequency modulation and Amplitude modulation. (2 marks)
    b) microphone and speaker (2 marks)
    c) Selectivity and Sensitivity (2 marks)

QUESTION FOUR

1. Sketch and label a block diagram of an AM receiver? (5 marks)

2. Specify the two transducers functions used in the system? (2 marks)

QUESTION FIVE

1. Specify two advantage and two disadvantages of Amplitude Modulation? (2marks)

THE END