



FIJI NATIONAL UNIVERSITY

SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING
COLLEGE OF ENGINEERING, SCIENCE AND TECHNOLOGY

CERTIFICATE IV IN ELECTRONIC ENGINEERING STAGE 5

EEE424 – RADIO RECEIVER & TRANSMITTER

FINAL EXAMINATION – PENSTER 1 2017.

DATE/DAY: Tuesday/7th March

TIME: 09:00 – 11:10AM

DURATION: 2 Hrs.

INSTRUCTIONS TO STUDENTS

1. You are allowed **10 minutes** extra **reading time** during which you are **NOT** to write.
2. Begin each answer on a fresh page and use both sides of the sheet.
3. Write your candidate number at the top of each attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with a string.
5. For all sheets of paper on which rough/draft work has been done, cross it through and **ATTACH** these to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Use of programmable calculator(s) is prohibited.
8. Attempt **ALL** questions.

SECTION A**TRUE OR FALSE****[20 MARKS]**

Read the statements below carefully and determine if it is True or False. Write down your answer in the answer sheet provided at the back of this question paper. You will do this by circling either T if it is true or F if the statement is false. Remove the answer sheet and insert it in your answer booklet when you finish. Secure with a string.

1. In an AM receiver, the VCO output is always 455Khz above the incoming tuned RF signal.
2. In any radio systems the base band signals have to be within the frequency range of 20Hz – 25Khz.
3. The AGC DC voltage will be constant in accordance with the incoming frequency.
4. SAW stands for solar active waveform.
5. Indirect and direct tuning are both two types of synthesized tuning methods.
6. In a modern radio receiver the LC tuned circuit is being replaced by a semiconductor component called the Varactor diode.
7. The Phase detector is not a part of the PLL, it is only connected to the PLL.
8. Automatic frequency tuning is a circuit that corrects IF frequency for proper processing by the receiver stages.
9. In the IF amp, there are two ceramic band pass filters. They are both tuned to 10.7Mhz.
10. In the transmission of intelligence of a radio system, the process applied to the carrier and the intelligence frequencies is called modulation and type in which the carrier level is varied is known as amplitude modulation (AM).
11. The station detector is controlled by the PLL.
12. VCO stands for variable Colpitt oscillator.
13. The SSB receiver is nearly identical to the transmitter except that the components are in reverse order.
14. In the LC tuning circuit the frequency is tuned or selected by turning the knob which in turn varies the values of either the resistance or the capacitance.

SECTION A

- continued...

TRUE OR FALSE**[20 MARKS]**

15. Narrow Band FM communications have very little noise suppression.

16. The output frequency of a frequency multiplier is always the harmonics of the fundamentals frequency of the oscillator.

17. In trouble shooting RF systems, resistances measured across an open circuit that is connected in parallel will read a resistance greater than the lowest resistive branch.

18. The interference which is identified by whistling sound can be eliminated by the type of filter called the band stop filter.

19. In fault finding, a resistance check across an open series circuit will read zero ohms .

20. The easiest method of locating the position of the RBS antenna is to use a handheld GPS receiver.

[1 Mark each]

SECTION B TERMINOLOGY & PROCESSES

[20 MARKS]

1. Draw the schematic diagram of the following filters and explain briefly how they work:
 - I. Low Pass Filter
 - II. High Pass Filter
 - III. Band Pass Filter
 - IV. Band Stop Filter

[1 Mark each]

2. Explain the following terms and processes as they occur in transmitters and receivers:
 - I. Pre-emphasis [2 Marks]
 - II. De-emphasis [2 Marks]

3. What is the purpose of frequency conversion and explain how it occurs in an AM radio receiver. [2 Marks]

4. With reference to a transmitter, what does the term Automatic Frequency Control (AFC) mean? [1 Marks]

5. A half-wave dipole is required to receive a 100 Mhz broadcast. Determine the optimum length of the dipole. [5 Marks]

6. What is the function of the muting network in a receiver? (2 Marks)

7. Compared to other types of receivers, what is the unique aspect of a single side band receiver? (2 marks)

SECTION C BLOCK DIAGRAMS – OPERATIONS & APPLICATIONS [20 MARKS]

1. Draw the block diagram of an FM receiver and label it clearly. [5 Marks]

2. What will be the frequency generated by the local oscillator of an AM receiver if it was tuned to receive a frequency of 700 kilo hertz? [1 Marks]

3. List down all the output frequency components of the mixer stage of the above receiver if it was modulated with a 1kHz tone at the transmitter end. [3 Marks]

4. Draw the schematic diagram of the following RF components and label correctly:
I) Pentode
II) Triode
III) Tetrode [6 Marks (2marks each)]

5. Using appropriate diagrams, explain what Band Width means in relation to radio communications [3 Marks]

6. List down 2 problems that would occur if a radio receiver were to have no Automatic Gain Control system. [2 Marks]

SECTION D**FAULT FINDING****[20 MARKS]**

1. A. In trouble shooting an electronic equipment, what are the four general steps that one needs to take to be able to find the fault? (4 Marks)

 B. In a radio circuit that has a number of integrated circuits (IC), how would test the IC's for faults? (2 Marks)

2. A radio transmitter is tripping off every time the operator tries to turn it on. Power supply is constant and there is no problem in the internal circuitry of the transmitter. You are assigned to locate the fault and rectify it. List down all the tools and accessories that you will need and the steps you will take to isolate the fault and return the transmitter to full operations. What will be the highest priority when attending to this fault? [10 Marks]

3. List down the tools and equipment you will need and the steps you will take to troubleshoot a radio receiver's RF section. [4 Marks]

SECTION E

RADIO BASE STATION

[20 MARKS]

1. You have been tasked with establishing a microwave radio link between Suva and Beqa Island
 - i. List down the first steps you will carry out before going to do some field tests. [5 Marks]
 - ii. List down 5 major tasks involved in the construction of the new station. [5 Marks]
 - iii. List down the main radio equipment that will need to be purchased. [5 Marks]

2. The remote site of the above radio network at Beqa island uses photovoltaic (solar power) to power the equipment. List down the routine maintenance tasks to be carried out for solar system. [5 Marks]

*****THE END*****

NOTE:

ANSWER SHEET FOR SECTION A IS ATTACHED (OVERLEAF). TEAR IT OFF, FILL IN THE CORRECT ANSWERS AND INSERT IT IN YOUR ANSWERBOOKLET

SECTION A**TRUE OR FALSE****[20 MARKS]****ANSWER SHEET FOR SECTION A**

Determine if the statement is either True or False. Circle your choice of answer in the table shown below. Insert into your answer booklet when completed.

1	T	F
2	T	F
3	T	F
4	T	F
5	T	F
6	T	F
7	T	F
8	T	F
9	T	F
10	T	F
11	T	F
12	T	F
13	T	F
14	T	F
15	T	F
16	T	F
17	T	F
18	T	F
19	T	F
20	T	F

(1 Mark each)