



COLLEGE OF ENGINEERING SCIENCE & TECHNOLOGY

SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

FINAL EXAMINATION-PENSTER 1-2013

CERTIFICATE IV IN ELECTRONIC ENGINEERING

EEE 424 RADIO RECEIVERS&TRANSMITERS

DAY/TIME : 3. TIME :

INSTRUCTIONS TO STUDENTS

1. You are allowed 10 minutes EXTRA time during which you are not to write.
2. Write your candidate number on the top of each sheet of the answer booklet.
3. Write all your answers in the ANSWER BOOKLET provided.
4. For all sheet of papers on which rough/draft work has been done, cross it through and attach these to your answer script.
5. There are NINE QUESTIONS worth a total of 125 MARKS.
6. Attempt all questions

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QUESTION ONE

Fill the space with the correct word or number to complete the statement. Write on your answer sheet the question number and the answer beside it.. DO IT RIGHT THE FIRST TIME.

1. In modern radio receiver the LC tuned circuit is being replaced by the electronic component called the _____ also known as _____
2. In a FM broadcasting radio system the input is called the _____ and is in the frequency range of _____
3. The modulating signals in a radio system is that which will cause the carrier to vary its amplitude if the system is using _____ modulation.
4. The modulating signals in a radio system is that which will cause the carrier to vary its frequency if the system is using _____ modulation.
5. In a radio broadcasting system the two sub-systems are the _____ and the _____.
6. The demodulator circuit is normally located in the receiver in order to separate the _____ from the amplitude waveform.
7. A radio receiver uses a ganged capacitor for the following functions :-
 - [a] to _____ the wanted RF signal.
 - [b] to translate the RF frequency to _____
8. In any superheteordyne radio receiver the frequency present at the output of the mixer stage is _____ than the wanted frequency at the antenna.
9. Capacitive reactance is the _____ of a capacitor to the flow of alternating current.
10. Capacitive reactance is given by the formula _____ = _____ ohm
11. Inductive reactance is the _____ of a coil to the flow of alternating current.
12. Inductive reactance is given by the formula _____ = _____ ohm
13. _____ is the circuit that regulates the amplifier gain to produce a constant output level.
14. _____ is a circuitry that corrects IF frequencies for proper processing by the receiver.
15. The main electronic component in any demodulator circuit is called the _____
16. The crystal oscillator is more advantageous than the conventional type in that its frequency is more _____

[20 marks]

QUESTION TWO

Write the question number on your answer sheet and beside it write the letter ' T ' if the statement is true and the letter ' F ' if the statement is false. DO IT RIGHT THE FIRST TIME.

(½ mark each)

1. T or F - APC is an electronic circuit that automatically maintains the phase of the oscillator output within the specified limit.
2. T or F - ALC is a circuitry commonly used in AM transmitter which keeps the modulation at a level approaching but never exceeds 100 %.
3. T or F - LC tuned circuit used in an oscillator determines the frequency of that oscillator.
4. T or F - The resonant frequency determining component of a tuned circuit can be replaced by a crystal but will be then subjected to frequency variations.
5. T or F - The purpose of an electrical filter is to separate one useful signal from all undesired signals
6. T or F - A High Pass Filter attenuates waves of all frequencies up to the desired frequency and transmits waves of higher frequencies.
7. T or F - A Low Pass Wave Filter transmits wave trains of all frequencies from zero up to the value for which it is set , and attenuates current waves of all higher frequencies.
8. T or F - A simple band pass filter will consist of two LC circuit connected in series.
9. T or F - The modulation process is not required in the process of distant communication.
10. T or F - Varicap diode has the characteristics that allow it to be used for tuned circuits that can be remotely controlled or tuned from a distance.
11. T or F - A buffer amplifier is normally connected to the output of an oscillator in order to isolate it from the next stage so that loading does not occur.
12. T or F - The resonant frequency of a tuned circuit can be calculated by the formula $f_r = \lambda xc$.
13. T or F - A CB radio normally operates at the frequency band in the 27 MHz.
14. T or F - The use of PLL circuit eliminates the need to use the transformer normally required for tuning circuit.
15. T or F - The two main requirements for a VCO is a linear frequency versus voltage characteristics and frequency stability.
16. T or F - Most frequency multipliers operate at the second or third harmonic of the input frequency, and are known as doublers and triplers respectively.
17. T or F - Reactance modulator is used for transmitting intelligence into distant destination by the process called amplitude modulation.
18. T or F - An amplifier called the driver is normally connected to the input of the power amplifier.
19. T or F - A limiter is a circuit whose output is a constant amplitude for all inputs above a critical value.
20. T or F - The input of an IF amplifier in a radio receiver is usually connected to the output of the mixer.

[10 marks]₃₀

QUESTION THREE

Match the LHS to the meaning at the RHS. Write the question number on your answer sheet and the answer beside it.

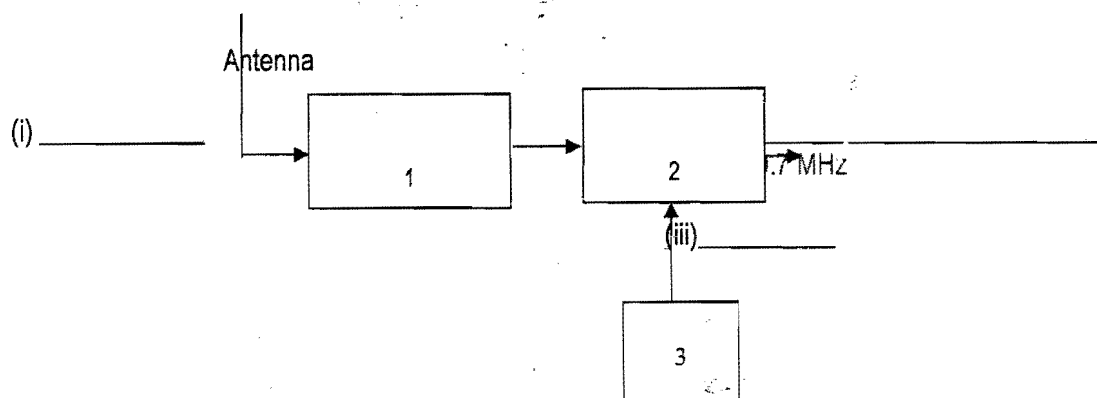
LHS		RHS	
1	Amplitude modulation	A	A type of filter used in high quality sets of radar equipment
2	Varactor diode	B	Used between two circuits to establish maximum power transfer
3	SAW	C	The last stage in an AM transmitter
4	VCO	D	Raises the frequency after it has been generated
5	Matching Network	E	The output of which is connected to the IF amplifier in a radio receiver.
6	Frequency Multiplier	F	A circuit to separate the audio from the FM modulated wave
7	Driver	G	Extract the intelligence from the amplitude modulated wave
8	Power amplifier	H	Reduces the phase shift
9	Mixer	I	Varying the level of the wave at the audio rate
10	FM Discriminator	J	Increases the modulation when the voltage is applied
11	Vacuum tube	K	Normally connected before the power amplifier to raise the level in order to drive the power amplifier
12	Triode	L	An oscillator whose frequency varied by a voltage applied at the control terminal
13	Thermionic emission	M	Varying capacitance by varying the depletion layer
14	Magnetron	N	The rate at which electrons move around the cathode in a magnetron
15	Crossed-field tubes	O	Emission of electrons from cathode in a vacuum
16	Pentode	P	A type of vacuum tube with three electrodes cathode, grid and plate
17	Cyclotron frequency	Q	A vacuum tube with 5 electrodes including control, suppressor & screen grids
18	26.965 MHz	R	Oldest microwave tube design which used a powerful permanent magnet
19	27.405 MHz	S	A type of vacuum tube with electrodes called cathode, plate, 2 grids
20	Tetrode	T	Consists of an evacuated glass or metal envelope containing two or more elements
		U	Another name for magnetron since the magnetic and electric field applied to the tube at right angles
		V	Channel 1 in the CB Channel Frequencies in the lower end of band
		W	Channel 40 in the CB channel Frequencies at the higher end of band

[20 marks] 50

QUESTION FOUR

1. Clearly write the question number on your sheet and the answer beside it.
Study the diagram below of the front end of a radio receiver; and answer the following questions :-

- (i) Name the block 1, 2 & 3 and is it a FM or AM receiver ? (4marks)
- (ii) State the name of the waveform at point (i) (2marks)
- (iii) State the waveform at point (ii) and its magnitude in relation to that of point (i) (2marks)
- (iv) State a probable frequency at point (i) (2marks)
- (v) What is the frequency at point (iii) in relation to frequency at point (i). (3marks)
- (vi) What would be the typical voltage level at point (i). (2marks)



(15 marks)₅₅

QUESTION FIVE

1. Draw a block diagram of an AM transmitter and :-

- [a] Label each block ? (7 marks)
- [b] Describe the functions of the two transducers used ? (2 marks)
- [c] Write down the possible frequency of the signal at the antenna compared to the crystal frequency ? (1 mark)
- [d] Clearly with the aid of diagrams describe how would you find the depth of modulation of a the transmitter you have drawn, using a CRO ? (5 marks)

[15 marks]₈₀

QUESTION SIX

1. Draw a block diagram of an AM radio receiver to show the following circuits. Label each of the following and explain their functions :-

- [a] RF Amplifier ? (2 marks)
- [b] Mixer ? (2 marks)
- [c] Local Oscillator ? (2 marks)
- [d] IF amplifier ? (2 marks)
- [e] Demodulator (2 marks)

[10 marks]

QUESTION SEVEN

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

2. Draw each waveform that would have been displayed on a CRO connected to the output of the following stages ;

[a] Oscillator ?

[b] Buffer Amp ?

[c] Frequency Multiplier ?

[d] Driver Amplifier?

[e] Power Amp ?

(5 marks)

[15 marks]₁₀₅

QUESTION EIGHT

1. Explain the meaning of the following :-

[a] Notch Filter

(1mark)

[b] Comb Filter

(1mark)

[c] Yagi Antenna

(3 mark)

[d] AM Waveform

(1 mark)

[e] FM Waveform

(1 mark)

[f] Modulator

(1mark)

[g] Matching

(1mark)

[h] CB Radio

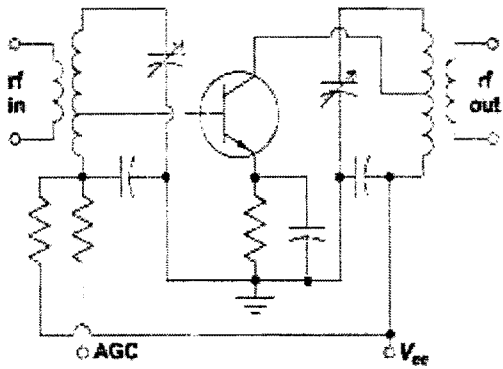
(1mark)

[10 marks]₁₁₅

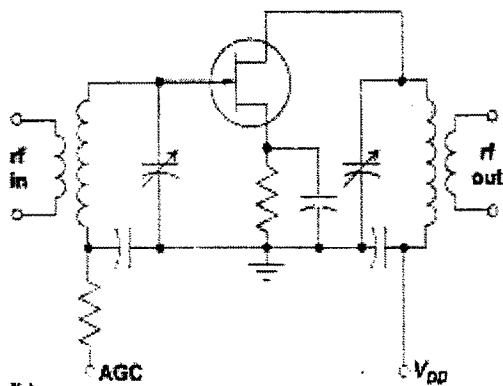
QUESTION NINE

Refer to the diagram below and answer the following questions:-

1. Name the circuit diagram (a)? 1 m
2. Name the circuit diagram (b)? 1m
3. Comment on a difference and similarity between circuit (a) and circuit (b) ?
4. What would you do if the waveform at "rf out" is to remain constant despite variations at the "rf in"? 4m
5. Briefly describe the functions of these circuits stating where to be used ? 4m



(a)



(b)

[10 marks]₁₂₅