FIJI NATIONAL UNIVERSITY

MARKING SCHEME

SCHOOL :Electrical and Electronics Engineering.

COURSE : Certificate IV in Electronics Engineering – Stage 5.
SUBJECT: EEE424 – Radio Receivers and Transmitters.
DATE : as per timetable
EXAMINER: Sunel Mani Goundar

SECTION A: MULTIPLE CHOICE [1 Mark each]

1	A	B	C	**D**
2	A	**B**	C	D
3	A	B	C	**D**
4	A	**B**	C	D
5	A	B	**C**	D
6	A	**B**	C	D
7	A	B	**C**	D
8	A	B	**C**	D
9	A	B	**C**	D
10	**A**	B	C	D
11	A	B	**C**	D
12	A	**B**	C	D
13	A	**B**	C	D
14	A	**B**	C	D
15	A	**B**	C	D
16	**A**	B	C	D
17	A	B	C	**D**
18	A	B	**C**	D
19	A	**B**	C	D
20	A	B	C	**D**

SECTION B **Matching** **[30 MARKS]**

1)	B	1 mark
2)	M	1 mark
3)	E	1 mark
4)	G	1 mark
5)	O	1 mark
6)	I	1 mark
7)	J	1 mark
8)	A	1 mark
9)	L	1 mark
10)	N	1 mark
11)	Q	1 mark
12)	R	1 mark
13)	AB	1 mark
14)	S	1 mark
15)	K	1 mark
16)	Y	1 mark
17)	AA	1 mark
18)	W	1 mark
19)	P	1 mark
20)	Z	1 mark
21)	X	1 mark
22)	V	1 mark
23)	H	1 mark
24)	C	1 mark
25)	T	1 mark
26)	U	1 mark
27)	AD	1 mark
28)	AC	1 mark
29)	F	1 mark
30)	D	1 mark

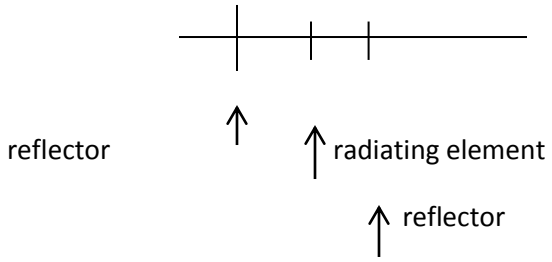
SECTION C CALCULATIONS & OPERATIONS [50 MARKS]

1. **(2 marks each)**

[a] Notch Filter - If an interfering signal has the carrier frequency of 1 KHz above that of the desired, the two carrier will mix in the detector to produce a difference frequency signal at 1 KHz, which shall cause a very audible whistle. The notch filter is tunable to the interfering signal to attenuate it and avoid whistle.

[b] Comb Filter - This is a type of filter that separate two different information signal.

[c] Yagi Antenna - This is a type of antenna that is used for radiating into space in the form of electromagnetic radiation. The radiating element is in between the reflector behind and the director in front as per the diagram below.



[d] AM Waveform - The waveform formed after the carrier frequency has been fed into the modulation process so that the amplitude of the carrier varies in sympathy of the audio signal. The resultant waveform changes in amplitude and frequency remains constant.

[e] FM Waveform - is the resultant waveform obtained after the modulation process given to the carrier by the audio. The frequency changes in sympathy with the audio while the amplitude remains constant.

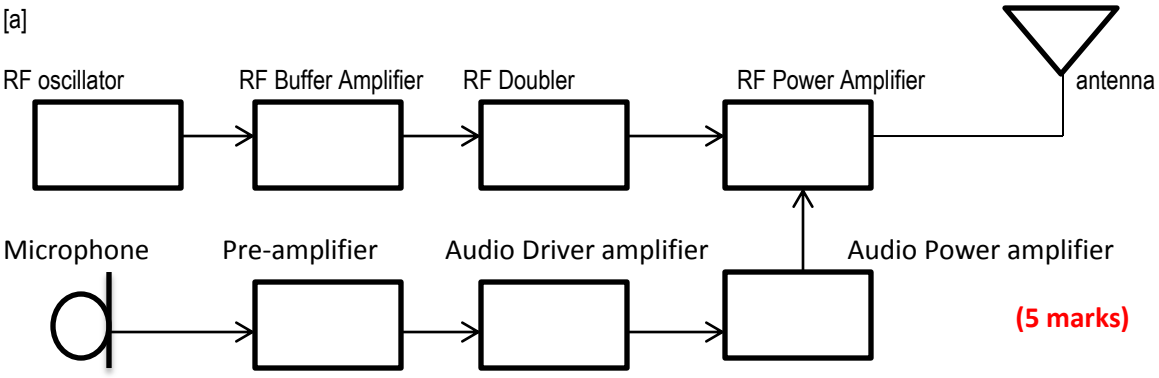
[f] Modulator is the electronic circuit in which the process of modulation is carried out by changing the characteristics of the carrier wave in sympathy of changes in intelligence signal.

[g] Matching is the process of making the output of an equipment equal to the input impedance of the equipment and are to be connected together for maximum power transfer.

[h] CB Radio is a means of radio communication system allocated for any citizen to use and the frequency is in the vicinity of 27 MHz in the frequency spectrum.

2.

[a]



(5 marks)

[b] **A transducer is the microphone which changes sound energy into electrical energy**
A transducer is the transmitting antenna which changes electrical energy into electromagnetic energy radiation. **(2 marks)**

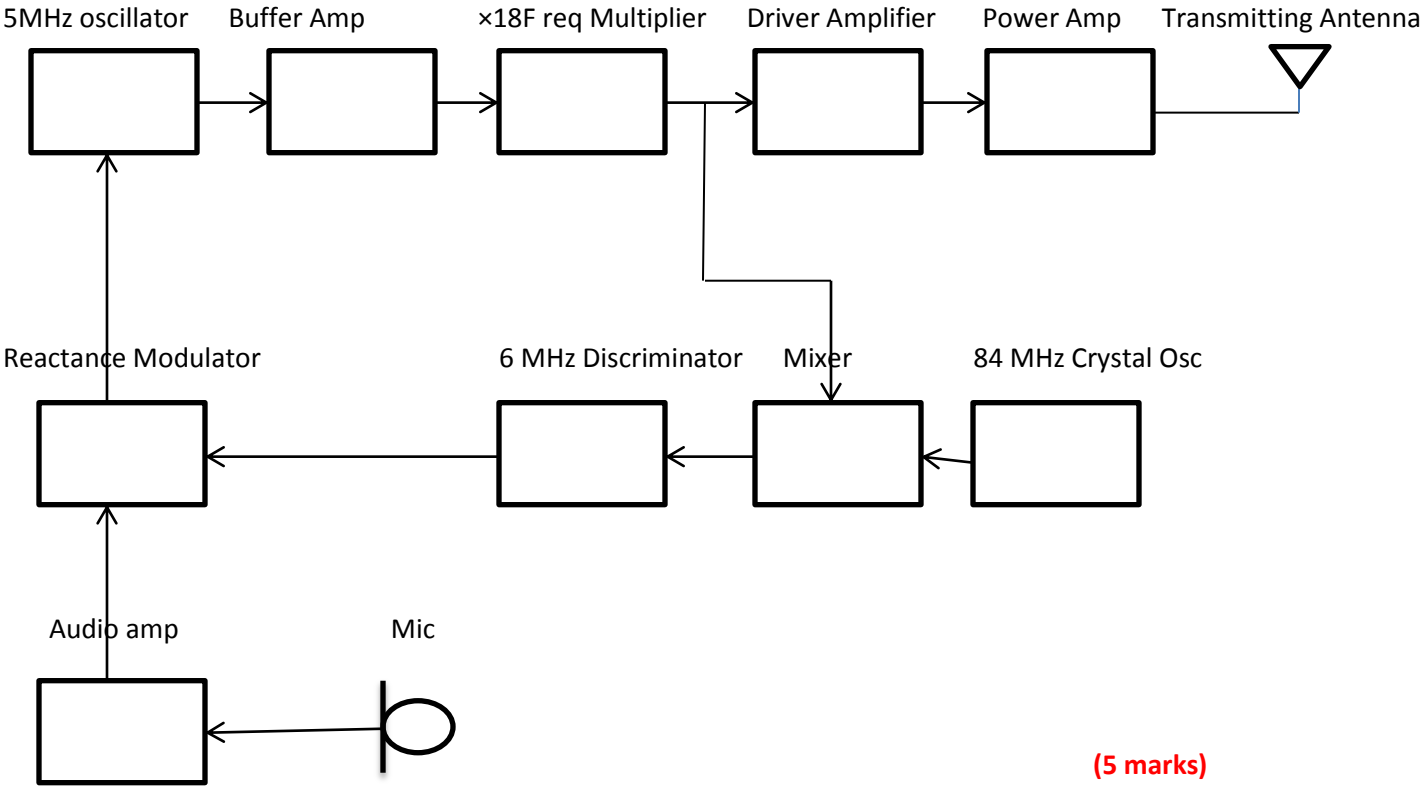
[c] If the crystal frequency is (say 5 MHz) then the antenna frequency is 10 MHz **(2 marks)**

[d] Extract a replica of the output and connect to the CRO. Adjust the CRO to display the AM

modulated wave and calculate the depth of modulation (M) using the formula;

$$M = \frac{V_{max} - V_{min}}{V_{max} + V_{min}} \times 100\ \%$$ **(3 marks)**

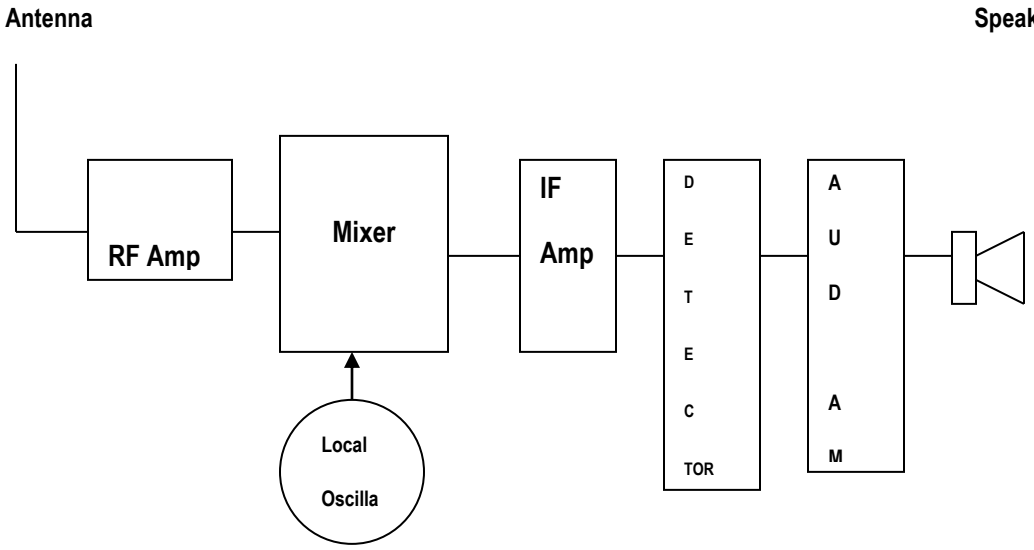
3.



(5 marks)

4.

a)



(5 marks)

b) The two transducers are the receiving antenna and the loudspeaker. The antenna converts the electromagnetic energy to electrical energy and the speaker converts electrical energy to sound energy.

(2 marks)

5. a)

$Fc = N \times f_{ref}$

$F_c = 200 \times 100\ kHz$

$\underline{F_c = 20\ MHz}$ **(3 marks)**

b) $K_f = f / V_p$

$V_p = f / K_f$

$V_p = 10\ KHz / 50\ KHz/v$

$\underline{V_p = 0.2\ V}$

$V_{rms} = V_p / \sqrt{2}$

$V_{rms} = 0.2 / \sqrt{2}$

$\underline{V_{rms} = 141\ mV}$ **(3 marks)**

6.

V_0 peak $= f / k_f$

$= 75KHz / 100KHz/v$

V_0 peak = 0.75 V

V_0 RMS = V_0 peak / $\sqrt{2}$

V_0 RMS = 0.75 / $\sqrt{2}$

$\underline{V_0 \text{ RMS} = 0.53V}$ **(2 marks)**

7.

$V_1 / V_2 = \text{anti log}\left(\frac{\frac{P_1}{P_2}}{20}\right)$

V_1 = (0.5µV) anti log (70/20)

$\underline{V_1 = 1.58\mu V}$ **(2 marks)**

THE END