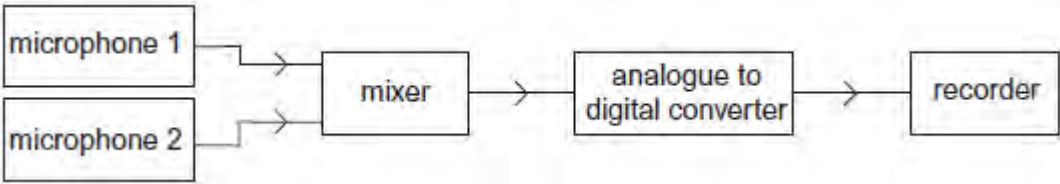


Q1. The diagram shows a block diagram of an audio recording system.



(a) Explain the purpose of the mixer in this system.

.....
.....

(1)

(b) Suggest a type of recorder that may be used in this system. Give **one** reason for your answer.

.....
.....
.....
.....

(2)

(c) Explain **one** advantage of including the analogue to digital converter in the system.

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.....
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.....

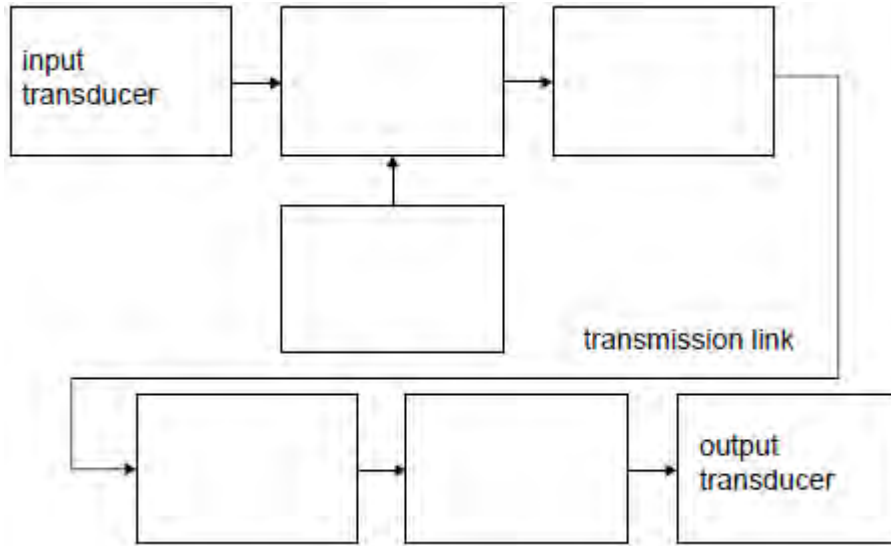
(2)
(Total 5 marks)

Q2. Figure 1 shows a block diagram of a generalised communications system.

(a) Complete the labelling of the block diagram, using the following terms:

carrier wave generator demodulator modulator receiver transmitter

Figure 1



(2)

(b) Name **three** different media suitable for the transmission link.

- 1.....
- 2.....
- 3.....

(3)

(c) (i) State the function of the modulator.

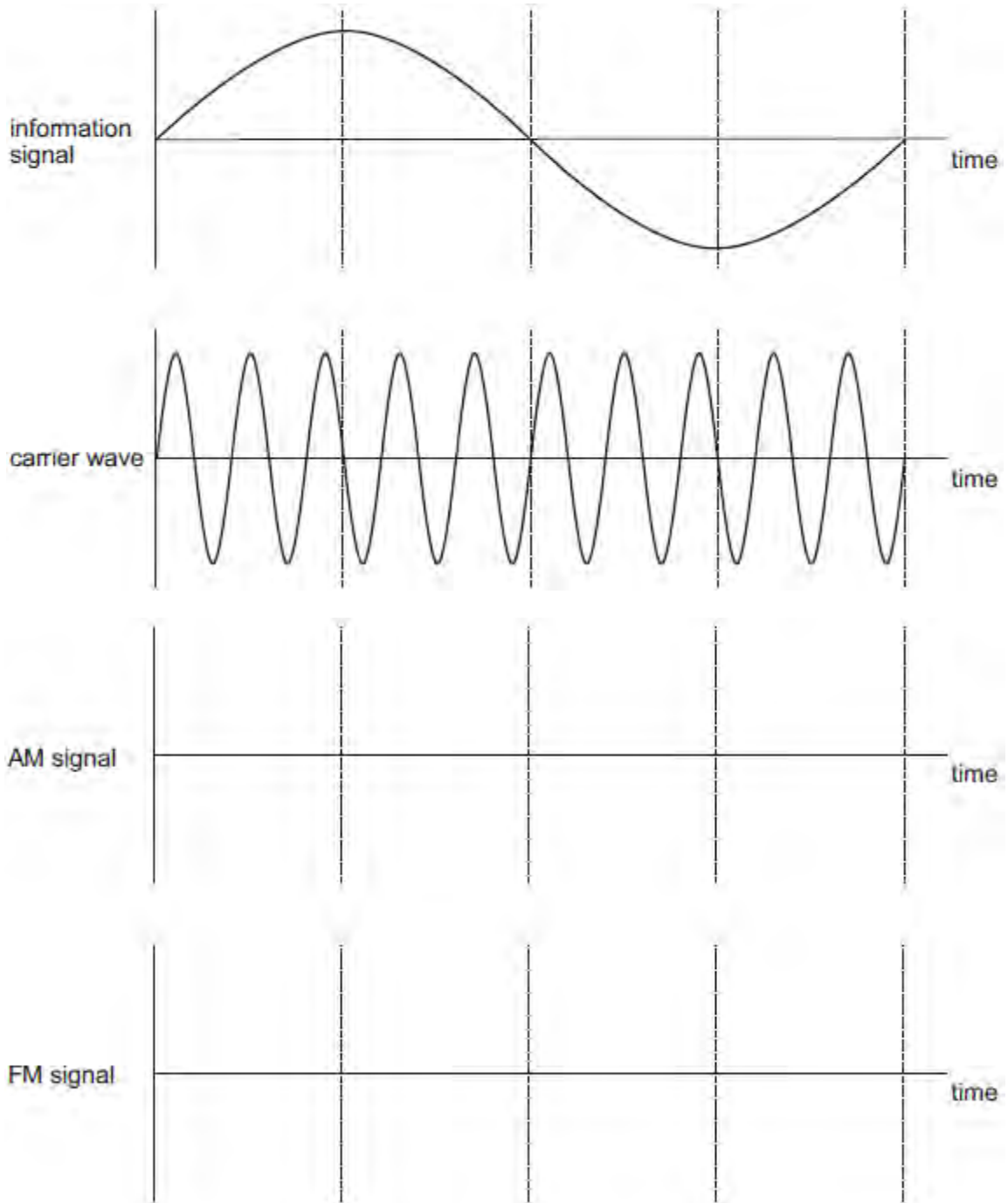
.....

(1)

(ii) AM and FM are two types of modulation. An information signal and a carrier wave are shown on the upper axes of **Figure 2**.

Draw on the lower axes the AM signal and the FM signal that these would produce.

Figure 2



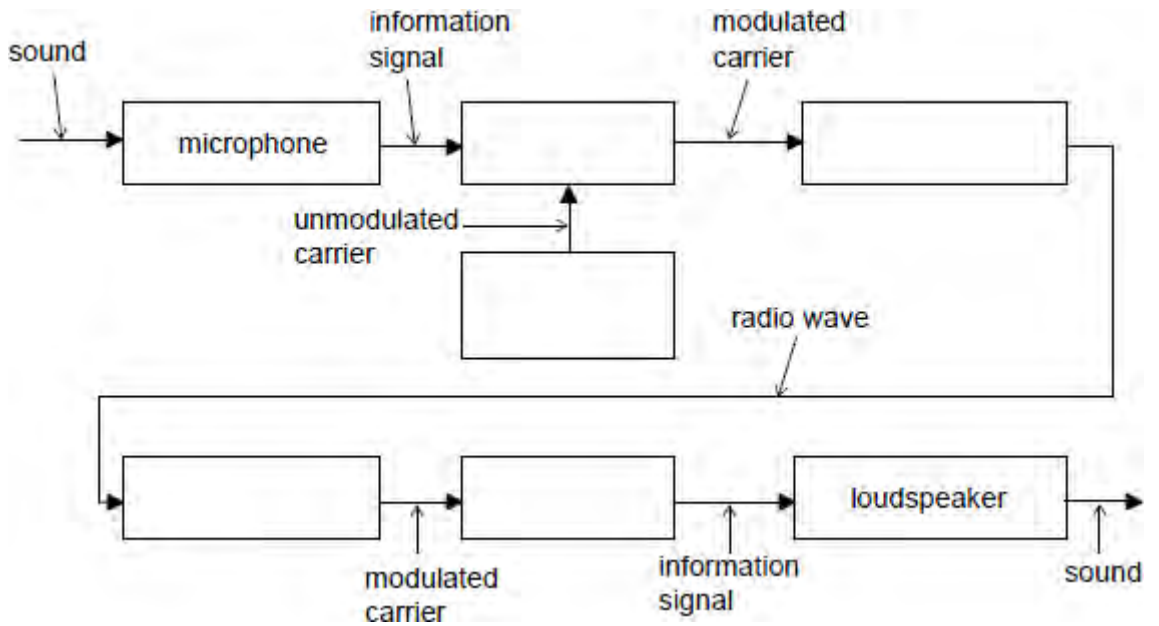
(4)
(Total 10 marks)

Q3.(a) Name **three** different types of medium that a modulated carrier signal could travel through.

- 1
- 2
- 3

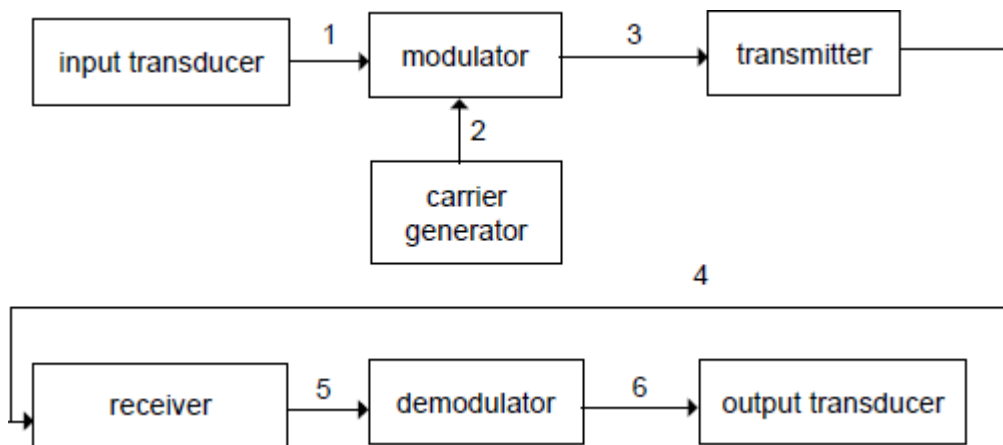
- (b) A block diagram of a radio communication system is shown below. The signals between subsystems are shown.

Label the blank boxes.



(5)
(Total 8 marks)

- Q4.A block diagram of a generalised communication system is shown below. The signals between subsystems have been numbered.



- (a) The type of signal at number 1 is an information signal and at number 3 it is a modulated carrier wave.
State the type of signal that could be at

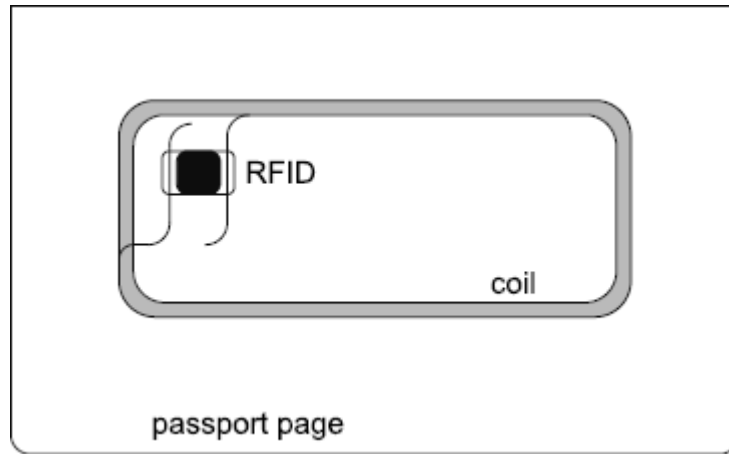
- (i) 2 (1)
- (ii) 4 (1)
- (iii) 5 (1)
- (iv) 6 (1)

(b) Name a subsystem in the diagram above which could contain

- (i) a diode (1)
- (ii) an oscillator (1)
- (iii) a loudspeaker (1)
- (iv) a tuned circuit (1)

(Total 8 marks)

Q5. Modern UK passports contain a Radio Frequency Identification Device (RFID) chip connected to a coil of wire.



- (a) The RFID chip operates at a frequency of 13.56 MHz. The RFID chip has an effective capacitance of 20 pF in parallel with the coil. Calculate the required inductance of the coil.

.....

.....

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.....

.....

(4)

- (b) Calculate the length of a half wave dipole aerial for this frequency. Explain why a coil of wire is used at the immigration control desk for reading the data on the RFID instead.

.....

.....

.....

.....

(3)

- (c) The quality factor, Q , of a tuned circuit is $\frac{f}{\Delta f}$.

If the bandwidth, Δf , of the tuned circuit in a passport is 100 kHz, calculate the quality factor of the tuned circuit.

.....

(1)

- (d) Assume the bandwidth given in part (c) represents the highest bit rate that can be used to transfer data from the RFID. Estimate, using a calculation, the length of time it would take to read 1 KB of data.

.....

(2)
 (Total 10 marks)

Q6.(a) A simple radio receiver system consists of the following subsystems.

af amplifier aerial detector loudspeaker tuned circuit

Label the diagram below with the subsystems in the correct order.



(5)

(b) Which subsystem has an input that is

(i) a narrow range of modulated radio frequency signals

(1)

(ii) a wide range of modulated radio frequency signals

(1)

(iii) a large amplitude audio frequency signal

(1)

(iv) a small amplitude audio frequency signal?

(1)

(c) Describe the function of the detector.

.....

.....

.....

(2)
(Total 11 marks)