

Name of the Student: _____

Max. Marks : 19 Marks

Time : 19 Minutes

Q1.

- (a) State what is meant by the *threshold of hearing* and state the frequency at which the reference threshold is quoted.

(2)

- (b) Sketch a curve on the axes to show how the threshold of hearing varies with frequency across the full range audible to a normal human ear. Add a suitable frequency scale to the frequency axis.



(5)

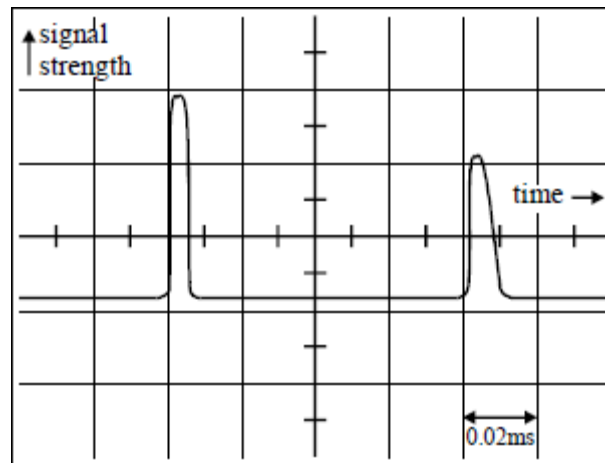
- (c) (i) Calculate the intensity of a sound which is found to have an intensity level of 60 Db above the threshold of hearing. The intensity of the threshold of hearing is $1.0 \times 10^{-12} \text{ W m}^{-2}$.

- (ii) The smallest increase in sound intensity which the human ear can detect is about 12%. Express this change in decibels.

(4)
(Total 11 marks)

Q2.

An ultrasound transducer is used to obtain an A-scan of an internal organ. The A-scan pulses shown on the diagram were identified as coming from the front and rear surfaces of the organ.



- (a) Describe the practical process, including details of the use of the transducer and the adjustment of the oscilloscope, required to produce this A-scan.

(3)

- (b) From the A-scan, estimate

- (i) the thickness of the organ if the speed of ultrasound in the tissue is 1500 m s^{-1} (the horizontal scale is 0.02 ms/cm),

- (ii) the duration of the first ultrasound pulse.

(3)

- (c) Give **two** reasons why the height of the second pulse is smaller than that of the first pulse.

(2)
(Total 8 marks)