Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Mark Schemes

Q1.

(a) (i) electric field across a transducer causes a change in physical dimensions **(1)**
if alternating voltage is applied the transducer vibrates at the same frequency **(1)**

(ii) maximum energy transfer when frequency of applied voltage = natural mechanical vibration frequency of the transducer **(1)**
causing resonance **(1)**

(4)

(b) (i) ultrasound transmitter or receiver or transducer is placed in contact with skin **(1)**
transmission is improved using oil layer between transducer and skin **(1)**
pulses of ultrasound are transmitted into the body **(1)**

(ii) echoes reflected back to transducer appear as voltage peaks or pulses on c.r.o. **(1)**
spacing of peaks gives time delay between transmitted pulse and echoes **(1)**
distance s between transmitter and a reflecting surface is given by $s = \frac{1}{2} c\Delta t$
where c = speed of ultrasound in tissue, Δt = time delay between pulses **(1)**

(iii) amplitude of pulses is attenuated as it penetrates deeper (caused by absorption and dispersion) **(1)**
amplitude of echo pulses depends on the proportions of ultrasound which are reflected and transmitted at each surface or boundary or
depends on the acoustic impedences of the two materials at the interface **(1)**

(iv) $\Delta t = 0.32 - 0.08 = 0.24$ m s **(1)**

$s = \frac{1}{2} c\Delta t = 0.5 \times 1500 \times 0.24 \times 10^{-3} = 0.18$ m **(1)** allow e.c.f.

(max 8)

[12]

Q2.

(a) pulse amplitude: 0.9 or 1.0 mV **(1)**

(1)

(b) $T = 0.7$ s **(1)**

$f = \frac{60}{0.7} = 86$ min^{-1} **(1)**

(2)

(c) T would get shorter **(1)**
flat part of trace would shrink **(1)**

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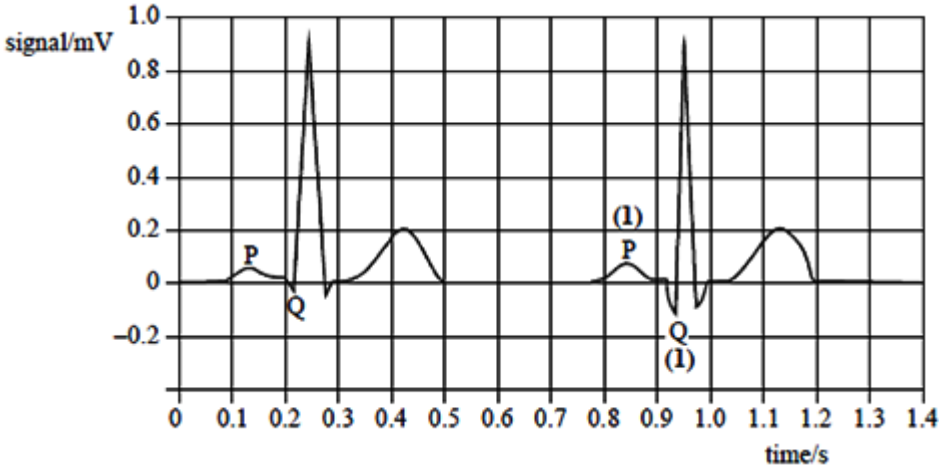
(2)

(d)



(2)

[7]

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