Medical Image Analysis

Week 1: Assignment Key & Solution

Answer Key:

Q No	Ans	Q No	Ans
1	a	11	a
2	d	12	b
3	a	13	a
4	d	14	b
5	-	15	a
6	c	16	d
7	b	17	b
8	c	18	c
9	c	19	c
10	b	20	b

Solutions:

Q1. Refer Lec. 1.1 Slide no. 3

Q2. Refer Lec. 1.1 Slide no. 13

Q3. Refer Lec. 1.1 Slide no. 14

Q4. Refer Lec. 1.1 Slide no. 15

Q5. $E_{kin} = 0.5 m_e v^2$

$M_e = 9.31 \times 10^{-31} \text{Kg}, v = 3 \times 10^8 \frac{m}{s}$

$\therefore E_{kin} = 41.89 \text{fJ}$

Q6. $E_{kin} = {hc}/{\lambda}, h = 6.6 \times 10^{-34} \text{ Js}, \ c = 3 \times 10^8 \frac{m}{s}, \lambda = 2\text{pm}$

$\therefore E_{kin} = 99 \text{fJ}$

Q7. Refer Lec. 1.2 Slide no. 6

Q8. $HU(x,y) = 1000 \frac{\mu(x,y) - \mu_{water}}{\mu_{water}}, \ \mu(x,y) = 0.237, \mu_{water} = 0.214$

$\therefore HU(x,y) = 107.48$

Q10. $\omega_o = \gamma B, \frac{\gamma}{2\pi} = 42.58 \text{ MHz}, B = 1.5\text{T}$

$\therefore \ \omega_o = 401.1 \text{MHz}$

Q.11 Refer Lec. 1.3 Slide no. 6

Q.12 Refer Lec. 1.3 Slide no. 11

Q13. $t_j = \dfrac{\sqrt{(R_{fp}^2 + x_j^2 - 2R_{fp}x_j\sin(\theta))}}{v}$, $R_{fp} = 10\text{cm}, \theta = 15°, x_j = 3 \times 1\text{mm}, v = 1540\text{m/s}$

$\therefore\ t_j = t_3 = 64.46\mu s$

Q14. Refer Lec. 1.4 Slide no. 11

Q15. Refer Lec. 1.4 Slide no. 10

Q16. Refer Lec. 1.4 Slide no. 9

Q17. $N.A = n\sin(\theta)$, $N.A = 0.5\ n = 1$

$\therefore \theta = 30°$

Q18. Refer Lec. 1.5 Slide no. 7

Q19. Refer Lec. 1.5 Slide no. 8

Q20. Refer Lec. 1.5 Slide no. 10