1. (4)

$$C=\frac{\epsilon_0 A}{d} \qquad C'=\frac{\epsilon_0 A}{d'-t\left(1-\frac{1}{k}\right)},$$

$$C=C';\ \frac{\epsilon_0 A}{d}=\frac{\epsilon_0 A}{d'-t\left(1-\frac{1}{k}\right)}$$

$$d=d'-t+\frac{t}{k},\quad 8=d'-4+\frac{4}{2} \text{ or } d'=10\text{mm}$$

2. (4)

$$\frac{1}{4\pi\epsilon_0}\frac{q_1q_2}{r^2}=mr\omega^2=\frac{4\pi^2mr}{T^2}$$

$$T^2=\frac{(4\pi\epsilon_0)r^2(4\pi^2mr)}{q_1q_2}=\frac{4\pi^2mr^3}{kq_1q_2}$$

$$T=\left[\frac{4\pi^2mr^3}{kq_1q_2}\right]^{1/2}$$

3. (2)

Potential gradient along wire

$$=\frac{\text{Potential difference along wire}}{\text{Length of wire}}$$

$$0.1\times10^{-3}=\frac{I\times40}{1000}\ \text{V cm}^{-1}$$

$$I=\frac{1}{400}\text{A} \quad \text{or} \quad I=\frac{E}{R+R'}$$

$$\therefore \quad \frac{2}{40+R}=\frac{1}{400}$$

$$\text{or}\quad R=800-40=760\ \Omega$$

4. (2)

$$I=\frac{2E}{2r+R},\qquad I'=\frac{E}{\frac{r}{2}+R}=\frac{2E}{r+2R}$$

If $I=I'$, then $2r+R=r+2R$

$$r=R=3\ \Omega$$

5. (3)

Current through each arm PRQ and PSQ = 1 A

$$V_P-V_R=3V;\quad V_P-V_S=7V$$

$$\therefore\ V_R-V_S=+4V$$

6. (4)

$$V=R\sin\delta \qquad R=\frac{V}{\sin\delta}$$

$$\tan 37^0=\frac{3}{4},\quad \therefore \quad \text{Sin}37^0=\frac{3}{5}$$

$$R=\frac{6\times10^{-5}}{3/5}=10\times10^{-5}=10^{-4}\text{T}$$

7. (4)

$$W=MB(1-\cos\theta) \qquad \tau=MB\sin\theta$$

$$\frac{\tau}{W}=\frac{\sin\theta}{1-\cos\theta}=\frac{\sin60^0}{1-\cos60^0}=\frac{\frac{\sqrt{3}}{2}}{1-\frac{1}{2}}=\sqrt{3}$$

$$\tau=\sqrt{3}\,W$$

8. (1)

9. (1) $\quad I^{st}\text{ case} \qquad \pi_1=\frac{36\times R\times300}{180}$

$$4.98=\frac{36\times R\times300}{180}$$

II^{nd} case $= 2.49=C\times R\times300$

$(II)\div(I)\ C=0.1\text{mol/L}$

10. (3)

$$K=\frac{1}{R}\times\frac{\ell}{a} \qquad 1.3=\frac{1}{50}\times\frac{\ell}{a}$$

Cell constant = 65

$$\wedge_m=\frac{K}{M\times1000}=\frac{1\times65}{260\times0.4\times1000}$$

$$=6.25\times10^{-4}\ \text{Sm}^2\text{mol}^{-1}$$

11. (4)

$$[R]=\frac{[R]_0}{2^n} \qquad 0.04=\frac{1.28}{2^n}$$

$$2^n=\frac{1.28}{0.04}=32$$

$$2^n=2^5\quad n=5$$

$$t=n\times t_{1/2}=5\times138=690\text{s}$$

12.(4) 13. (4) 14. (1)
15. (3) 16. (4) 17. (4)
18. (3) 19. (4) 20. (2)
21. (1) 22. (3) 23. (2)
24. (2) 25. (3) 26. (1)
27. (2) 28. (3)
29. (3) 30. (2)