4.8 (A) $\vec{\nabla} \times \vec{H} = \vec{J}$

(B) $\int_{c} \vec{E} \cdot \vec{a}_{t} = -\frac{d}{f} \int_{s} \vec{B} \cdot \vec{ds}$

(C) $\vec{\nabla} \vec{J} = -\frac{\partial_p}{\partial_t}$

(1) Continuity equation
(2) Faraday's law
(3) Ampere's Law
(4) Gauss's law
(5) Biot-Savart law

ANSWERS

1. 1 (*c*)	1. 2 (*d*)	1. 3 (*d*)	1. 4 (*b*)	1. 5 (*c*)	1. 6 (*d*)	1. 7 (*c*)	1. 8 (*b*)	1. 9 (*c*)	1. 10 (*a*)
1. 11 (*b*)	1. 12 (*d*)	1. 13 (*c*)	1. 14 (*d*)	1.15 (*a*)	1. 16 (*c*)	1. 17 (*b*)	1. 18 (*c*)	1. 19 (*a*)	

EXPLANATIONS

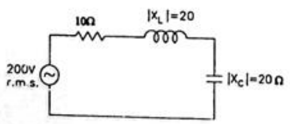
1.3 Voltage across the capacitor

$$= \frac{200}{\sqrt{R^2 + (X_L - X_C)^2}} \times (-jX_C)$$

$$= \frac{200}{\sqrt{100 + (20-20)^2}} \times (-j20)$$

$$= -j\,400$$

$$= 400 \angle -90 \text{ V}$$



1.4 In the Laplace domain,

$$V_o(s) = \frac{V_i(s)}{R + \frac{1}{Cs}} \times R$$

$$= \frac{V_i(s)\,RCs}{RCs+1}$$

$$V_i(t) = 100\, t\, u(t)$$

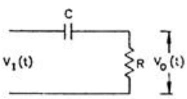
and $V_i(s) = \frac{100}{s^2}$

Hence, $V_o(s) = \frac{100}{s^2}\left[\frac{5 \times 10^3 \times 10^{-6} s}{5 \times 10^3 \times 4 \times 10^{-6} s + 1}\right]$

$$= \frac{2}{s\left(2 \times 10^{-2} s + 1\right)} \approx \frac{2}{s}$$

$V_o(t) = 2\,u(t)$

$\therefore$ Maximum voltage = 2 V



1.5 $H(s) = \frac{\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2}$

$$H(j\omega) = \frac{\omega_n^2}{-\omega^2 + 2\zeta\omega_n j\omega + \omega_n^2}$$

$$|H(jw)| = \frac{\omega_n^2}{\sqrt{\left(\omega_n^2 - \omega^2\right)^2 + \left(2\zeta w_n \omega\right)^2}}$$

$$|H(j0)| = 1$$

If ω_c is the 3 – *d*B frequency, then

$$[H(j\omega_c)] = \frac{\omega_n^2}{\sqrt{\left(\omega_n^2 - \omega_c^2\right)^2 + \left(2\zeta w_n \omega_c\right)^2}}$$

$$= 0.707$$