3.5 (*a*) SSB Modulation (1) Transmission line
(*b*) $\nabla \cdot \overline{B} = 0$ (2) Hilbert transform
(*c*) Model dispersion (3) Faraday's law
(4) Absence of magnetic monopoles
(5) Waveguides
(6) Phase-locked loop

ANSWERS

1. 1 (*b*)	1. 2 (*d*)	1. 3 (*c*)	1. 4 (*a*)	1. 5 (*d*)	1. 6 (*c*)	1. 7 (*c*)	1. 8 (*c*)	1. 9 (*d*)	1. 10 (*a*)
1. 11 (*b*)	1. 12 (*d*)	1. 13 (*b*)	1. 14 (*c*)	1.15 (*c*)	1. 16 (*c*)	1. 17 (*c*)	1. 18 (*b*)	1. 19 (*d*)	1. 20 (*d*)
2. 1 (*d*)	2. 2 (*a*)	2. 3 (*b*)	2. 4 (*b*)	2. 5 (*b*)	2. 6 (*a*)	2. 7 (*a*)	2. 8 (*a*)	2. 9 (*a*)	2. 10 (*c*)
2. 11 (*d*)	2. 12 (*b*)	2. 13 (*c*)	2. 14 (*d*)	2. 15 (*c*)	2. 16 (*d*)	2. 17 (*d*)	2. 18 (*b*)	2. 19 (*c*)	2. 20 (*a*)

EXPLANATIONS

1.1 $A_1 = \sqrt{A_2^2 + A_3^2} = \sqrt{3^2 + 4^2} = 5\text{ A}$

1.2 The meter will read during positive half for half-wave rectifier.

$$V_{av} = \frac{V_m}{\pi R} = \frac{4}{\pi 10\text{ K}} = \frac{0.4}{\pi}\text{ mA.}$$

Hence none of the answer is correct as current is given in A and not in *m*A.

1.4 A short circuited line of length $\lambda/4$ shows infinite impedance at the other end, hence the current is zero.

1.6 $V_{CE} = V_{BE} + V_{CB}$.

As V_{CB} is increased, V_{CE} is pushed to the negative region, I_C start even from the negative region and transistor operates in the reverse active mode.

1.7 $\beta_{forced} = \beta_F$ in the active region.
In the saturation region β_{forced} is less then β_F.

1.11 Since delay has to be of finite number of clock pulses.

1.12 Flash type $1\ \tau$, where τ is clock period.
Counter type $(2^n - 1)\ \tau = 4095\ \mu$ sec.
Integrating type > 4095 μ secs.
Successive Apporximation type $n\,\tau = 12\ \mu$ secs.

1.17 Response cut-off resonance, $A_R = \dfrac{1}{\sqrt{1 + y^2 Q^2}}$

where $y = \dfrac{\omega}{\omega_R} - \dfrac{\omega_R}{\omega}$

ω = image frequency.
So the first detector gives some image rejection which may be sufficient at low tuned frequencies. As this may be insufficient at high frequencies, RF stages may be added.

1.18 $$\omega = \frac{1}{\sqrt{LC}},$$

Now $Z_o = \sqrt{\dfrac{L}{C}}$

$\Rightarrow \quad \sqrt{L} = Z_o \sqrt{C}$

$$\therefore \quad \omega = \frac{1}{Z_o \sqrt{C}\sqrt{C}} = \frac{1}{Z_o C}$$

1.19 Polarisation mismatch means that if the wave is left circularly polarised, the antenna is right circularily polarised and power transfer is 0.

1.20 Charge enclosed by the cube,

$Q = 4\,\pi \times 1^2 \times 10 = 40\,\pi$

$$D = \frac{Q}{\text{Area of one face}} = \frac{40\pi}{100} = 0.4\,\pi\text{ C/m}^2$$

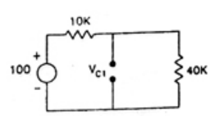
2.

2.2 $$F(s) = \frac{s+5}{(s+1)(s+3)} = \frac{A}{s+1} + \frac{B}{s+3}$$

$$A = \left.\frac{s+5}{s+3}\right|_{s=-1} = 2, \quad B = \left.\frac{s+5}{s+1}\right|_{s=-3} = \frac{2}{-2} = -1$$

$$\therefore L^{-1} F(s) = 2e^{-t} - e^{-3t}$$

2.3 In steady state, capacitors are open and inductances are short.



For V_{C1}

$$V_{C1} = 100 \times \frac{40}{50} = 80\text{ V}$$