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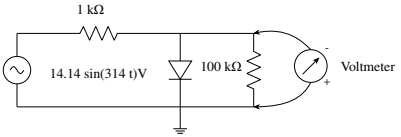
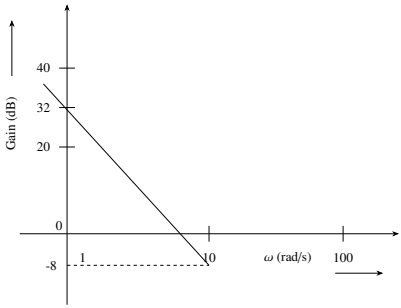
AI24BTECH11002 - K. Akshay Teja

1) The input impedance of the permanent magnet moving coil (PMMC) voltmeter is infinite. Assuming that the diode shown in the figure below is ideal, the reading of the voltmeter in Volts is:



a) 4.46 b) 3.15 c) 2.23 d) 0

2) The Bode plot of a transfer function $G(s)$ is shown in the figure below.



The gain $(20\log|G(s)|)$ is 32 dB and -8 dB at 1 rad/s and 10 rad/s respectively. The phase is negative for all ω. Then $G(s)$ is:

a) $\frac{39.8}{s}$ b) $\frac{39.8}{s^2}$ c) $\frac{32}{s}$ d) $\frac{32}{s^2}$

3) A bulb in a staircase has two switches, one switch being at the ground floor and the other one at the first floor. The bulb can be turned ON and also can be turned OFF by any one of the switches irrespective of the state of the other switch. The logic of switching of the bulb resembles:

a) an AND gate b) an OR gate c) an XOR gate d) a NAND gate

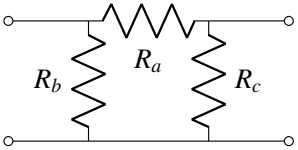
4) For a periodic signal $v(t) = 30\sin(100t) + 10\cos(300t) + 6\sin(500t + \pi/4)$, the fundamental frequency in rad/s is:

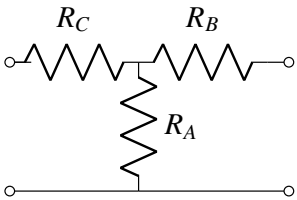
a) 100 b) 300 c) 500 d) 1500

5) A band-limited signal with a maximum frequency of 5 kHz is to be sampled. According to the sampling theorem, the sampling frequency in kHz which is not valid is:

a) 5 b) 12 c) 15 d) 20

6) Consider a delta connection of resistors and its equivalent star connection as shown below. If all elements of the delta connection are scaled by a factor of k ($k > 0$), the elements of the corresponding star equivalent will be scaled by a factor of:



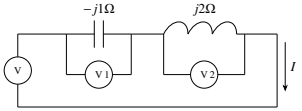


a) k^2 b) k c) $\frac{1}{k}$ d) $\sqrt{k}$

7) The angle δ in the swing equation of a synchronous generator is the:
   a) angle between stator voltage and current
   b) angular displacement of the rotor with respect to the stator
   c) angular displacement of the stator mmf with respect to a synchronously rotating axis
   d) angular displacement of an axis fixed to the rotor with respect to a synchronously rotating axis

8) Leakage flux in an induction motor is:
   a) flux that leaks through the machine
   b) flux that links both stator and rotor windings
   c) flux that links none of the windings
   d) flux that links the stator winding or the rotor winding but not both

9) Three moving iron type voltmeters are connected as shown below. Voltmeter readings are V, V_1, and V_2 as indicated. The correct relation among the voltmeter readings is:



a) $V = \frac{V_1}{\sqrt{2}} + \frac{V_2}{\sqrt{2}}$ b) $V = V_1 + V_2$ c) $V = V_1 V_2$ d) $V = V_2 - V_1$

10) Square roots of $-i$, where $i = \sqrt{-1}$, are:

a) $i, -i$
b) $\cos\left(-\frac{\pi}{4}\right) + i\sin\left(-\frac{\pi}{4}\right), \cos\left(\frac{3\pi}{4}\right) + i\sin\left(\frac{3\pi}{4}\right)$
c) $\cos\left(\frac{\pi}{4}\right) + i\sin\left(\frac{3\pi}{4}\right), \cos\left(\frac{3\pi}{4}\right) + i\sin\left(\frac{\pi}{4}\right)$
d) $\cos\left(\frac{3\pi}{4}\right) + i\sin\left(-\frac{3\pi}{4}\right), \cos\left(-\frac{3\pi}{4}\right) + i\sin\left(\frac{3\pi}{4}\right)$

11) Given a vector field $F = y^2 x a_x - yz a_y - x^2 a_z$, the line integral $\int F \cdot dl$ evaluated along a segment on the x-axis from $x = 1$ to $x = 2$ is:

a) -2.33 b) 0 c) 2.33 d) 7

12) The equation $\begin{bmatrix} 2 & -2 \\ 1 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ has

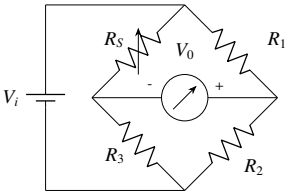
a) no solution

b) only one solution $\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$

c) non-zero unique solution

d) multiple solution

13) A strain gauge forms one arm of the bridge shown in the figure below and has a nominal resistance without any load as $R_1 = 300\ \Omega$. Other bridge resistances are $R_2 = R_3 = R_4 = 300\ \Omega$. The maximum permissible current through the strain gauge is 20 mA. During a certain measurement when the bridge is excited by maximum permissible voltage and the strain gauge resistance is increased by 1% over the nominal value, the output voltage V_0 in mV is:



a) 56.02 b) 40.83 c) 29.85 d) 10.02