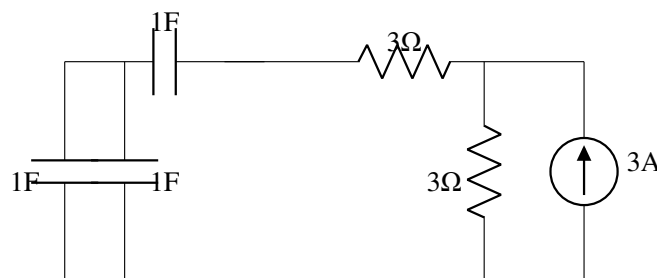


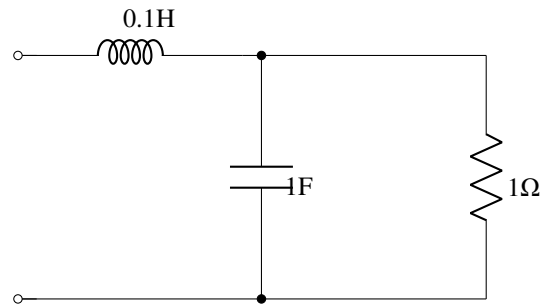
2008-EE-18-34

AI24BTECH11011 - Himani Gourishetty

- 1) A 3-phase Voltage source Inverter is operated in 180° conduction mode. Which one of the following statements is true?
 - a) Both pole-voltage and line-voltage will have 3^{rd} harmonic components
 - b) Pole-voltage will have 3^{rd} harmonic components but line-voltage will be free from 3^{rd} harmonic
 - c) Line-voltage will have 3^{rd} harmonic components but pole-voltage will be free from 3^{rd} harmonic
 - d) Both pole-voltage and line-voltage will be free from 3^{rd} harmonic components
- 2) The impulse response of a causal linear time-invariant system is given as $h(t)$. Now consider the following two statements:
 Statement (I): Principle of superposition holds
 Statement (II): $h(t) = 0$ for $t < 0$
 Which one of the following statements is correct?
 - (A) Statement (I) is correct and Statement (II) is wrong
 - (B) Statement (II) is correct and Statement (I) is wrong
 - (C) Both Statement (I) and Statement (II) are wrong
 - (D) Both Statement (I) and Statement (II) are correct
- 3) It is desired to measure parameters of 230v/115v, 2kVA, single-phase transformer. The following wattmeters are available in a laboratory.
 W_1 : 250V, 10A, Low Power Factor
 W_2 : 250v, 5A, Low Power Factor
 W_3 : 150V, 10A, High Power Factor
 W_4 : 150V, 5A, High Power Factor
 The wattmeters used in open circuit test and short circuit test of the transformer will respectively be
 - a) W_1 and W_2
 - b) W_2 and W_4
 - c) W_1 and W_4
 - d) W_2 and W_3
- 4) The time constant for the given circuit will be



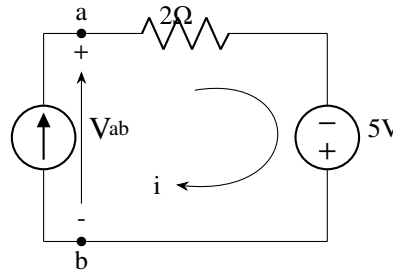
- a) $\frac{1}{9}$ s
- b) $\frac{1}{4}$ s
- c) 4s
- d) 9s



5) The resonant frequency for the given circuit will be

- a) $1 \frac{\text{rad}}{\text{s}}$
- b) $2 \frac{\text{rad}}{\text{s}}$
- c) $3 \frac{\text{rad}}{\text{s}}$
- d) $4 \frac{\text{rad}}{\text{s}}$

6) Assuming ideal elements in a circuit shown below, the voltage V_{ab} will be



- a) -3V
- b) 0V
- c) 3V
- d) 5V

7) A capacitor consists of 2 metal plates each $500 \times 500 \text{ mm}^2$ and spaced 6 mm apart. The space between the metal plates is filled with glass plate of 4mm thickness and a layer of paper of 2mm thickness. The relative permittivities of the glass and paper are 8 and 2 respectively. Neglecting the fringing effect, the capacitance will be (Given that $\epsilon_0 = 8.85 \times 10^{-12} \frac{\text{F}}{\text{m}}$)

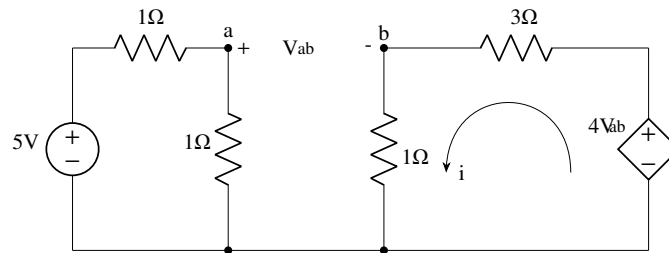
- a) 983.33pF
- b) 1475 pF
- c) 6637.5 pF
- d) 9956.25 pF

8) A coil of 300 turns is wound on a non-magnetic core having a mean circumference of 300mm and a cross-sectional area of 300 mm^2 . The inductance of the coil corresponding to a magnetizing current of 3A will be (Given that $\mu_0 = 4\pi \times 10^{-7}$)

- a) $37.68 \mu\text{H}$
- b) $113.04 \mu\text{H}$
- c) 37.68 mH
- d) 113.04 mH

9) In the circuit shown in the figure, the value of the current i will be given by

- a) 0.31A
- b) 1.25A



- c) 1.75A
d) 2.5A
- 10) Two point charges $Q_1 = 10\mu C$ and $Q_2 = 20\mu C$ are placed at coordinates $(1, 1, 0)$ and $(-1, -1, 0)$ respectively. The total electric flux passing through a plane $z = 20$ will be
- a) $7.5\mu C$
b) $135\mu C$
c) $15.0\mu C$
d) $22.5\mu C$
- 11) Given a sequence $x[n]$, to generate the sequence $y[n] = x[3 - 4n]$, which one of the following procedures would be correct?
- a) First delay $x[n]$ by 3 samples to generate $z_1[n]$, then pick every 4^{th} sample of $z_1[n]$ to generate $z_2[n]$, and then finally time reverse $z_2[n]$ to obtain $y[n]$
b) First advance $x[n]$ by 3 samples to generate $z_1[n]$, then pick every 4^{th} sample of $z_1[n]$ to generate $z_2[n]$, and then finally time reverse $z_2[n]$ to obtain $y[n]$
c) First pick every fourth sample of $x[n]$ to generate $V_1[n]$, time-reverse $v_1[n]$ to obtain $v_2[n]$, and finally advance $v_2[n]$ by 3 samples to obtain $y[n]$
d) First pick every fourth sample of $x[n]$ to generate $V_1[n]$, time-reverse $v_1[n]$ to obtain $v_2[n]$, and finally delay $v_2[n]$ by 3 samples to obtain $y[n]$
- 12) A system with input $x(t)$ and output $y(t)$ is defined by the input-output relation:

$$y(t) = \int_{-\infty}^{-2t} x(\tau) d\tau \quad (1)$$

The system will be

- a) casual, time-invariant and unstable
b) casual, time-invariant and stable
c) non-casual, time-invariant and unstable
d) non-casual, time-invariant and unstable
- 13) A signal $x(t) = \sin c(\alpha t)$ where α is a real constant ($\sin c(x) = \frac{\sin(\pi x)}{\pi x}$) is the input to a Linear Time invariant system whose impulse response $h(t) = \sin c(\beta t)$ where β is a real constant. If $\min(\alpha, \beta)$ denotes the minimum of α and β , and similarly $\max(\alpha, \beta)$ denotes the maximum of α and β , and K is a constant, which one of the following statements is true about the **output of the system**?
- a) It will be of the form $K \sin c(\gamma t)$ where $\gamma = \min(\alpha, \beta)$
b) It will be of the form $K \sin c(\gamma t)$ where $\gamma = \max(\alpha, \beta)$
c) It will be of the form $K \sin c(\alpha t)$
d) It cannot be a $\sin c$ type of signal
- 14) Let $x(t)$ be a periodic signal with time period T . let $y(t) = x(t - t_0) + x(t + t_0)$ for some t_0 . The Fourier Series coefficients of $y(t)$ are denoted by b_k . If $b_k = 0$ for all odd k , then t_0 can be equal to
- a) $\frac{T}{8}$
b) $\frac{T}{4}$
c) $\frac{T}{2}$

d) $2T$

15) $H(z)$ is a transfer function of a real system. When a signal $x[n] = (1 + j)^n$ is the input to such a system, the output is zero. Further, the Region of Convergence (ROC) of $\left(1 - \frac{1}{2}z^{-1}\right)H(z)$ is the entire Z-plane (except $z = 0$). It can then be inferred that $H(z)$ can have a minimum of

- a) one pole and one zero
- b) one pole and two zeros
- c) two poles and one zero
- d) two poles and two zeros

16) Given $X(z) = \frac{z}{(z-a)^2}$ with $|z| > a$, the residue of $X(z)z^{n-1}$ at $z = a$ for $n \geq 0$ will be

- a) a^{n-1}
- b) a^n
- c) na^n
- d) na^{n-1}

17) Consider function $f(x) = (x^2 - 4)^2$ where x is a real number. Then the function has

- a) only one minimum
- b) only two minima
- c) three minima
- d) three maxima