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- 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 3rd harmonic components but line-voltage will be free from 3rd 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 3rd 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

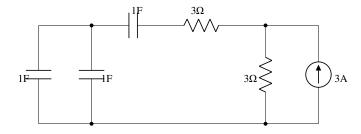
 W_2 : 250v,5A,Low Power Factor

 W_3 : 150V, 10A, High Power Factor

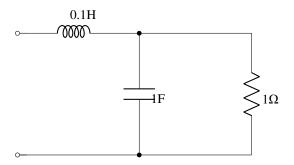
 W_4 : 150V, 5A, High Power Factor

The wattmeters used in open circuit test and short circuit test of the transformer will respectively be

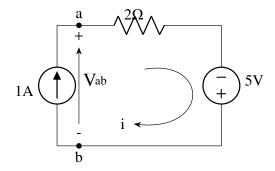
- a) W_1 and W_2
- b) W_2 and W_4
- c) W_1 and W_4
- d) W_2 and W_3
- 4) The time constant for the given circuit will be



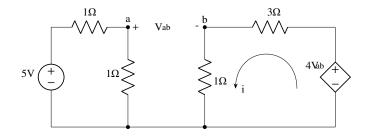
- a) $\frac{1}{9}$ s
- b) $\frac{1}{4}$ s
- c) 4s
- d) 9s
- 5) The resonant frequency for the given circuit will be
 - a) $1 \frac{rad}{s}$



- b) $2 \frac{rad}{s}$
- c) $3 \frac{rad}{s}$
- d) 4 $\frac{rad}{s}$
- 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 $500 \times 500 mm^2$ 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 $\epsilon_0 = 8.85 \times 10^{-12} \frac{F}{m}$)
 - 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 $300mm^2$. The inductance of the coil corresponding to a magnetizing current of 3A will be (Given that $\mu_0 = 4\pi \times 10^{-7}$)
 - a) $37.68 \mu H$
 - b) $113.04\mu H$
 - 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:

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

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 $\left(\sin c(x) = \frac{\sin(\pi x)}{\pi x}\right)$ 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) $\bar{2}T$

- 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 $n \ge 0$ 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