

Electrical Engineering-2011

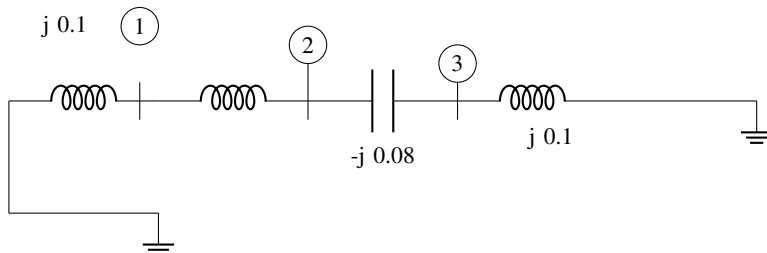
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AI24BTECH11005 - Bhukya Prajwal Naik

- 1) A capacitor is made with a polymeric dielectric having an ϵ_r of 2.26 and a dielectric breakdown strength of $50 \frac{kV}{cm}$. The permittivity of free space is $8.85 \frac{pF}{m}$. If the rectangular plates of the capacitor have a width of 20cm and a length of 40cm, then the maximum electric charge in the capacitor is
- a) $2\mu C$ b) $4\mu C$ c) $8\mu C$ d) $10\mu C$
- 2) The response of a linear time invariant system to an impulse $\delta(t)$, under initially relaxed condition is $h(t) = e^{-t} + e^{-2t}$. The response of this system for a unit step input $u(t)$ is
- a) $u(t) + h(t)$ b) $u(t) * h(t)$ c) $(1.5 - h(t))u(t)$ d) $h(t)((\delta(t) + u(t)))$
- 3) The direct axis and quadrature axis reactances of a salient pole alternator are 1.2p.u and 1.0p.u respectively. The armature resistance is negligible. If this alternator is delivering rated kVA at upf and at rated voltage then its power angle is
- a) 30°
b) 45°
c) 60°
d) 90°
- 4) A $\frac{9}{2}$ digit DMM has the error specification as 0.2% of reading 10 counts. If a dc voltage of 100V is read on its 200V full scale, the maximum error that can be expected in the reading is
- a) 0.1% b) 0.2% c) 0.3% d) 0.4%

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- 5) A three-bus network is shown in the figure below indicating the p.u impedance of each element



The bus admittance matrix Y-bus of the network is

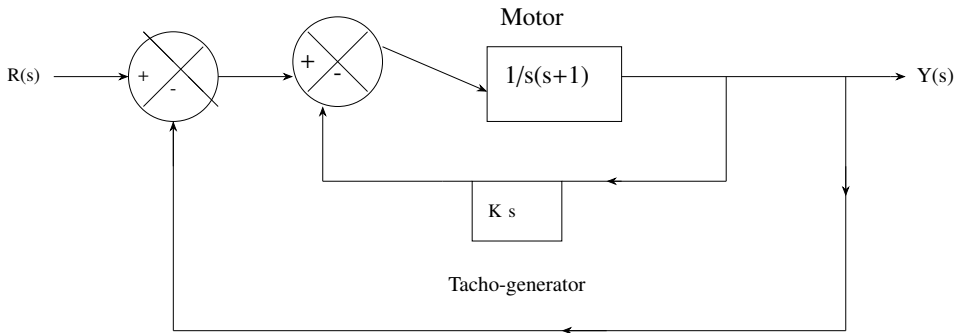
a) $j \begin{pmatrix} 0.3 & -0.2 & 0 \\ -0.2 & 0.12 & 0.08 \\ 0 & 0.08 & 0.02 \end{pmatrix}$

b) $j \begin{pmatrix} -15 & 5 & 0 \\ 5 & 7.5 & -12.5 \\ 0 & -12.5 & 2.5 \end{pmatrix}$

c) $j \begin{pmatrix} 0.1 & 0.2 & 0 \\ 0.2 & 0.12 & -0.08 \\ 0 & -0.08 & 0.10 \end{pmatrix}$

d) $j \begin{pmatrix} 10 & 5 & 0 \\ 5 & 7.5 & 12.5 \\ 0 & 12.5 & -10 \end{pmatrix}$

6) A two-loop position control system is shown below. The gain k of the Tacho generator



influences mainly the

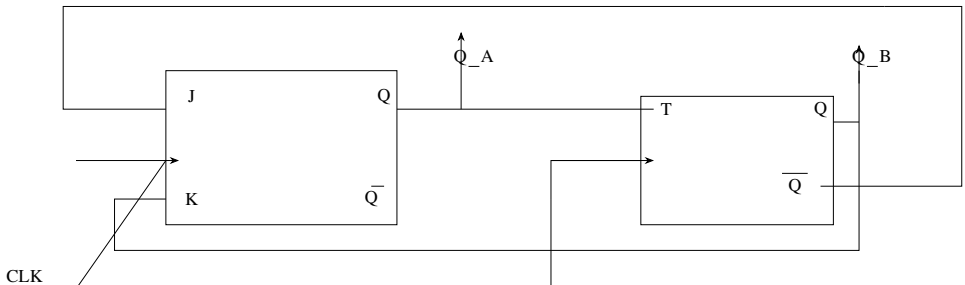
a) peak overshoot

b) natural frequency of oscillation

c) phase shift of the closed loop transfer function at very low frequencies ($\omega \rightarrow 0$)

d) phase shift of the closed loop transfer function at very low frequencies ($\omega \rightarrow \infty$)

7) A two-bit counter circuit is shown below. In the state $Q_A Q_B$ of the counter at the

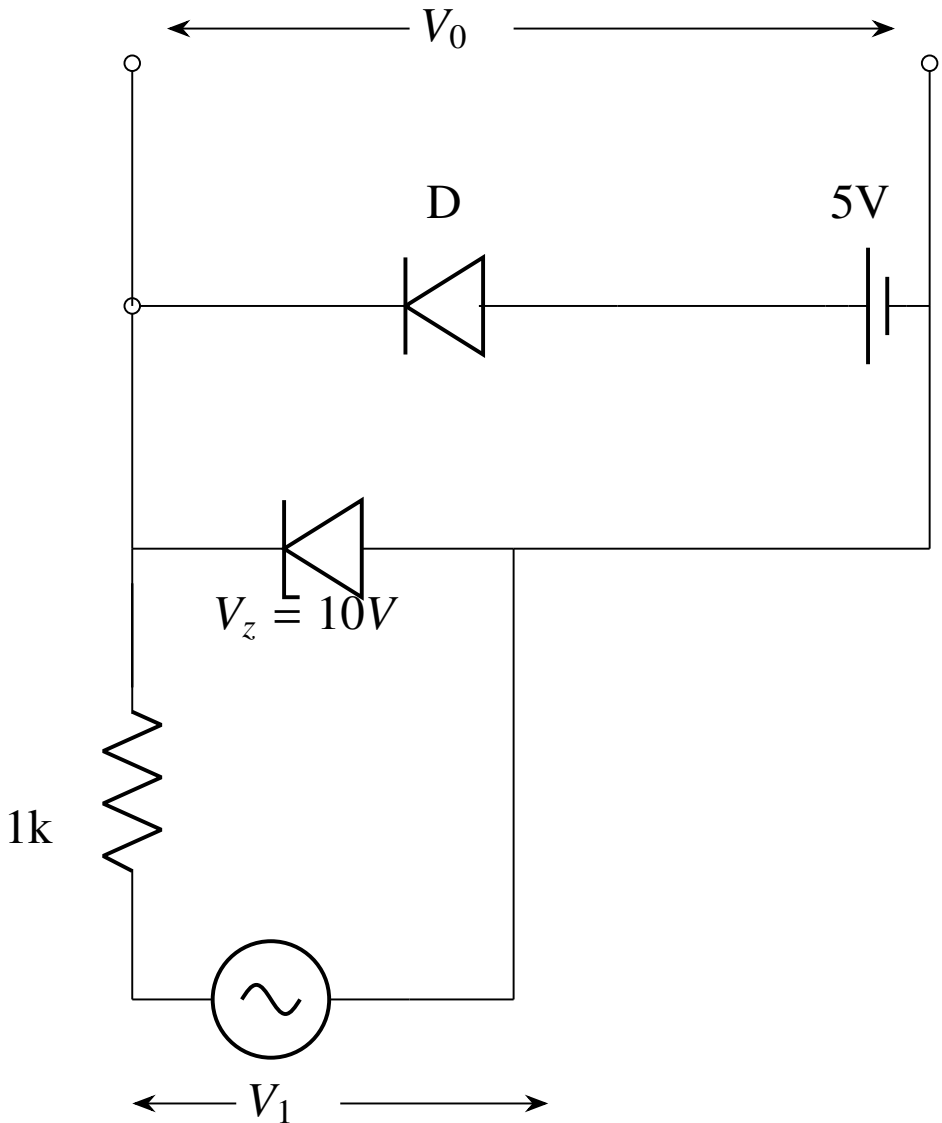


clock time t_n is 10, the the state $Q_A Q_B$ of the counter at $t_n + 3$ (after three clock

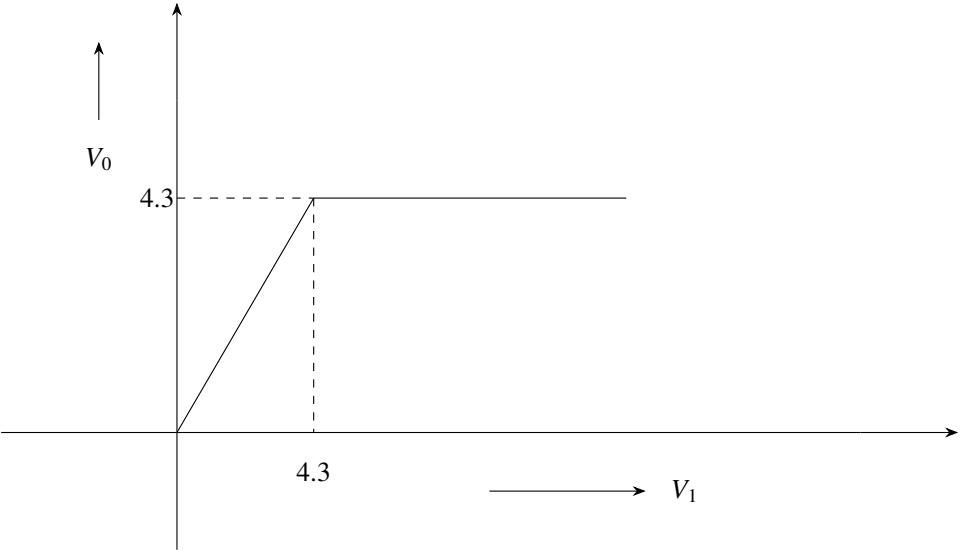
cycles) will be

- a) 00
- b) 01
- c) 10
- d) 11

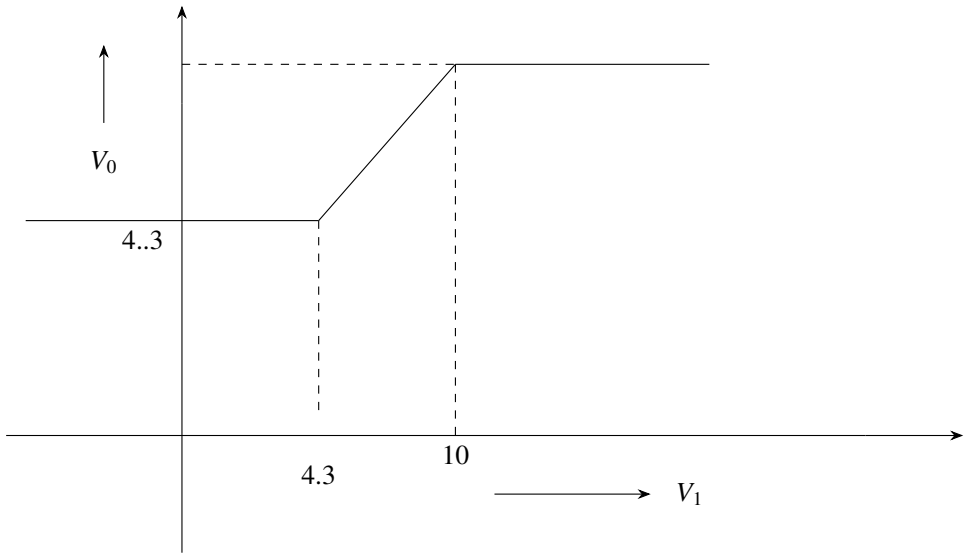
8) A clipper circuit is shown below. Assuming forward voltage drops of the diodes to



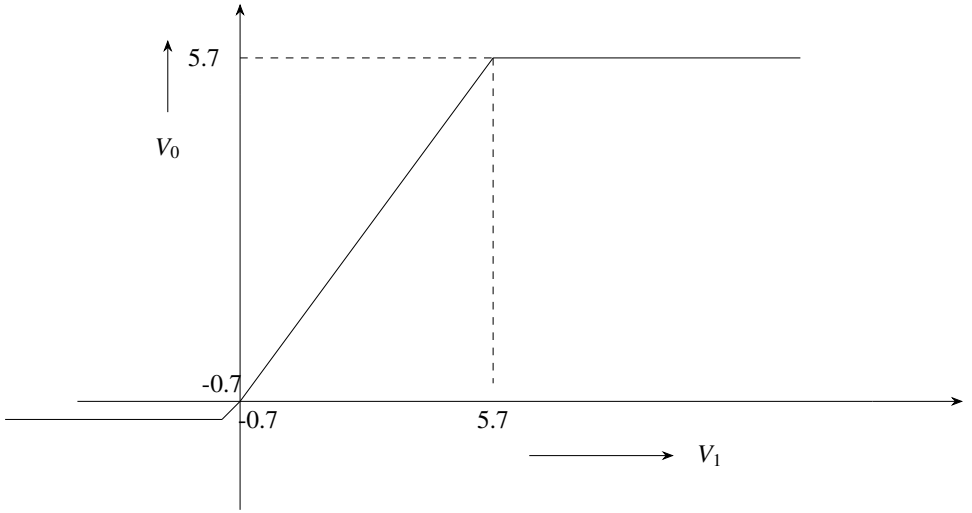
be 0.7 V, the input-output transfer characteristics of the circuit is



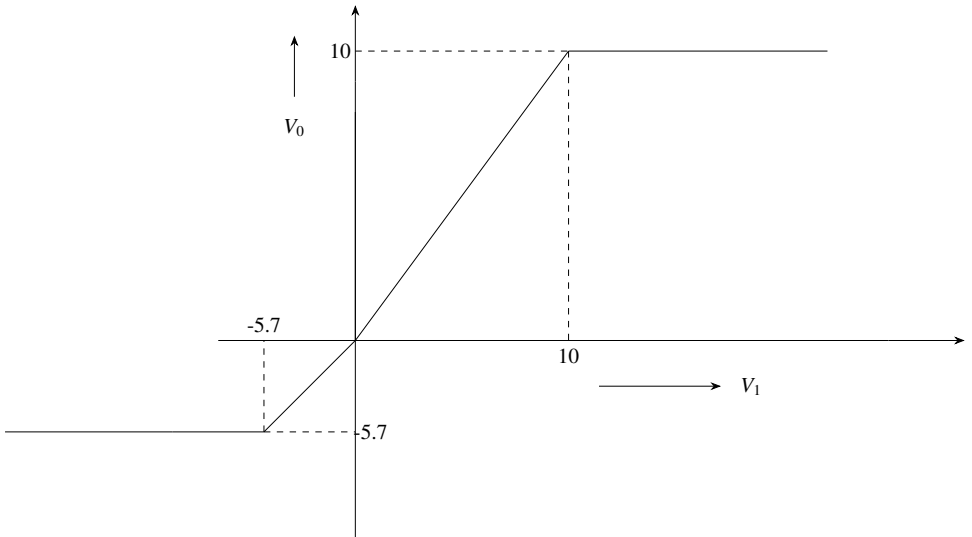
a)



b)



c)



d)

Common Data for the below two questions The input voltage given to a converter is $v_i = 100\sqrt{2}\sin(100\pi t)V$, The current drawn by the converter is $i_1 = (10\sqrt{2}\sin(100\pi t - \frac{\pi}{3}) + 5\sqrt{2}\sin(300\pi t + \frac{\pi}{4}) + 2\sqrt{2}\sin(500\pi t - \frac{\pi}{6}))A$

9) Then the power factor of the converter is

a) 0.31

b) 0.44

c) 0.5

d) 0.71

10) Then the active power drawn by the converter is

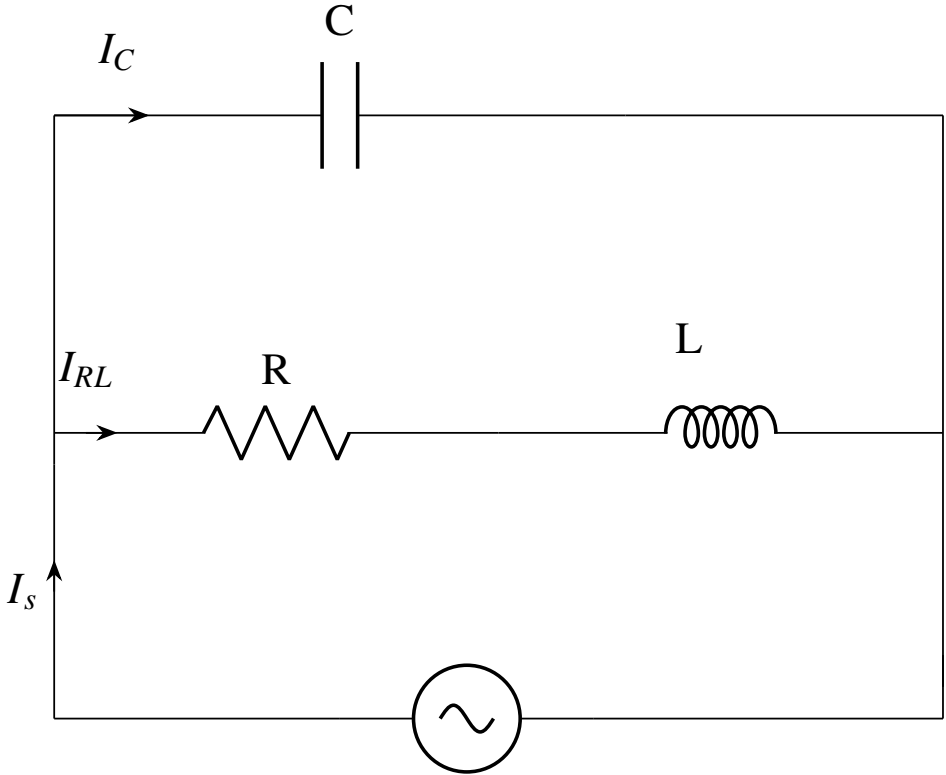
a) 181 W

b) 500 W

c) 707 W

d) 887 W

Common Data for Questions 50 and 51: An RLC circuit with relevant data is given below: $V_S = 1\angle 0^\circ \text{ V}$ $I_S = \sqrt{2}\angle \frac{\pi}{4} \text{ A}$ $I_{RL} = \sqrt{2}\angle \frac{-\pi}{4} \text{ A}$



11) The power dissipated in the resistor R

a) 0.5 W

b) 1 W

c) $\sqrt{2} \text{ W}$

d) 2 W

12) The current I_C in the figure above is

a) $-j \text{ 2A}$ b) $-j\frac{1}{\sqrt{2}} \text{ A}$ c) $+j\frac{1}{\sqrt{2}} \text{ A}$ d) $+j \text{ 2A}$