Electrical Engineering-2011

AI24BTECH11005 - Bhukya Prajwal Naik

1) A capacitor is made with a polymetric dielectric having an ϵ_r of 2,26 and a dielectric breakdown strength of $50\frac{kV}{cm}$ .The permitivity 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 implulse $\delta(t)$. under initially relaxed condition is $h(t) = e^{-}1 + e^{-}2t$. 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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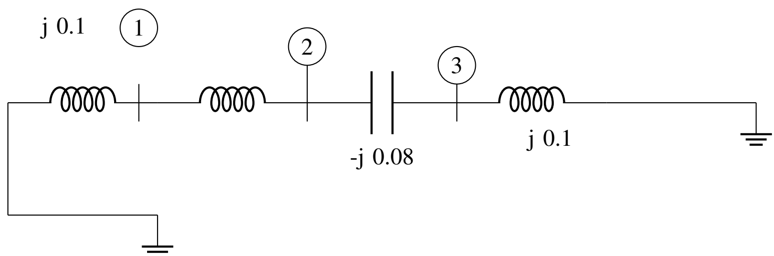
5) A three-bus network is shown in the figure below indicating the p.u impedance of each element



The bus admittance matrix Y-bus of the network is

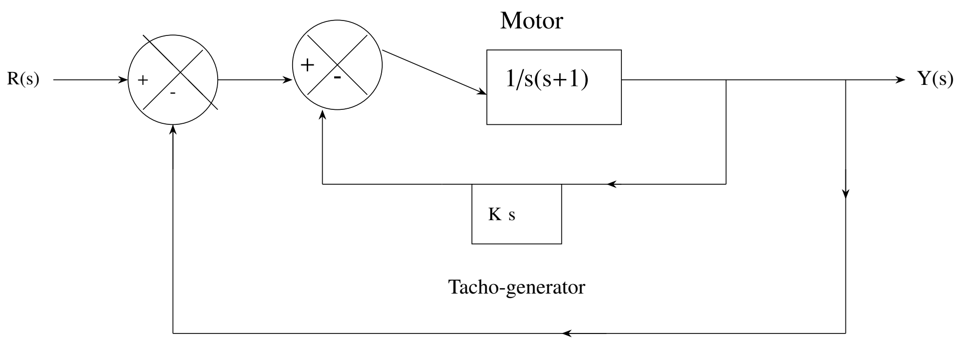
a) $j\begin{pmatrix} 0.3 & -0.2 & 0 \\ -0.2 & 0.12 & 0.08 \\ 0 & 0.08 & 0.02 \end{pmatrix}$

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

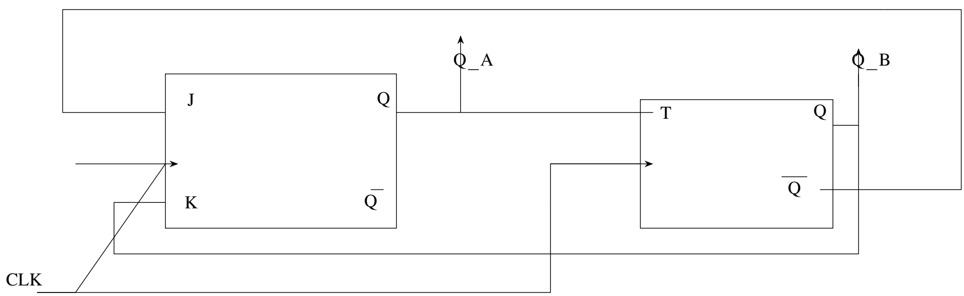
6) A two-loop position control system is shown below The gain k of the Tacho generator



influences mainly the

a) peak overshoot
b) natural frequency of oscillation
c) phase shift of the closed loop transfer function at very low frequencies ($\omega \to 0$)
d) phase shift of the closed loop transfer function at very low frequencies ($\omega \to \infty$)

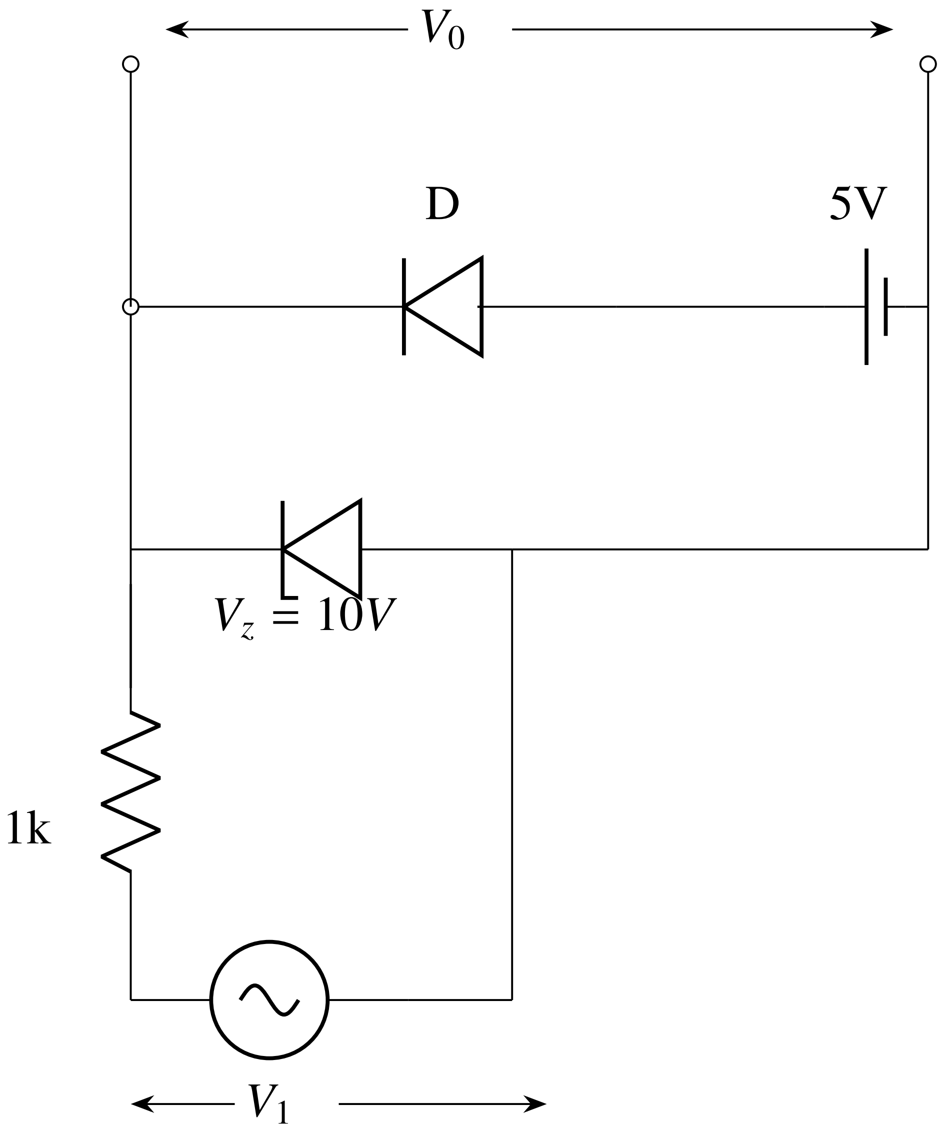
7) A two-bit counter circuit is shown below In the state $Q_A Q_B$ of the counter at the



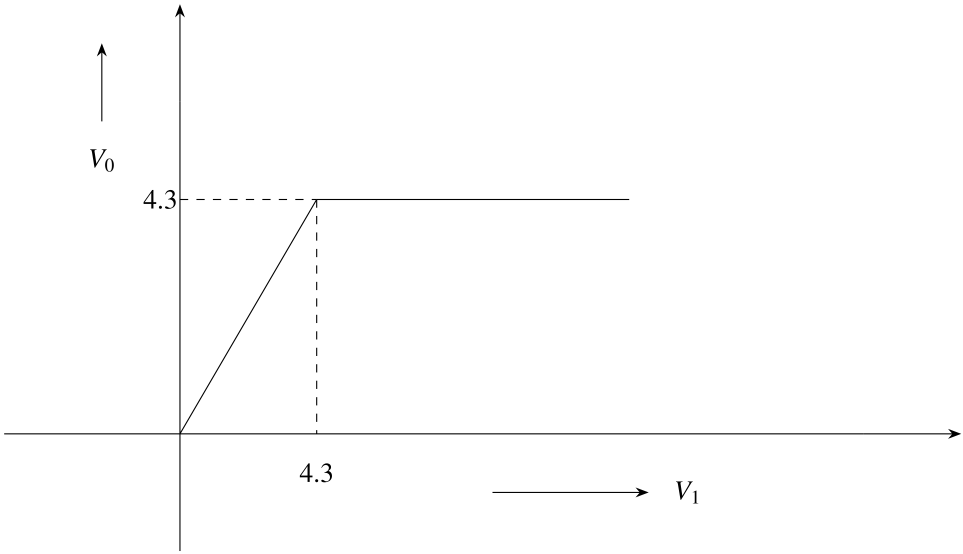
clock time t_n is 10, the the state $Q_A Q_B$ of the counter at t_n + 3(after three clock cycles) will be

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

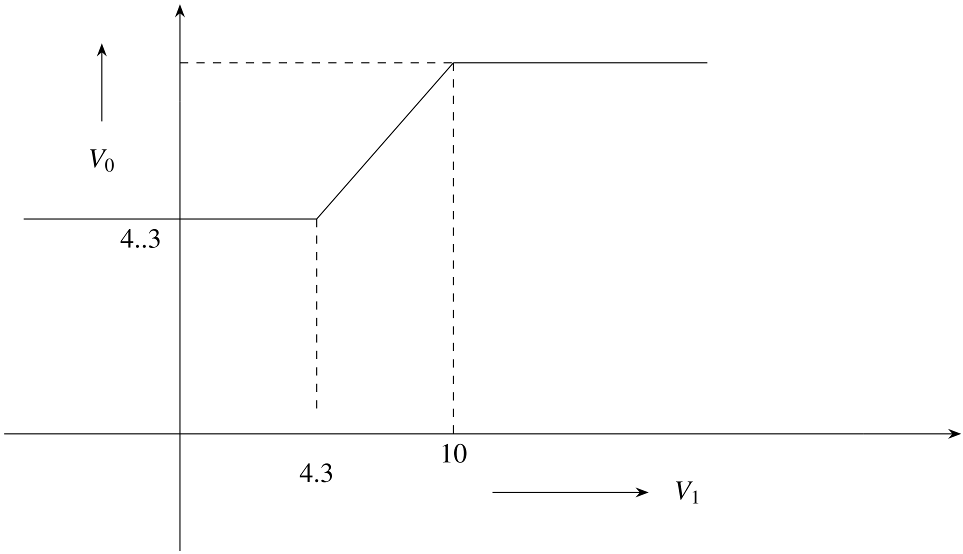
8) A clipper circuit is shown below. Assuming forward voltage drops of the diodes to



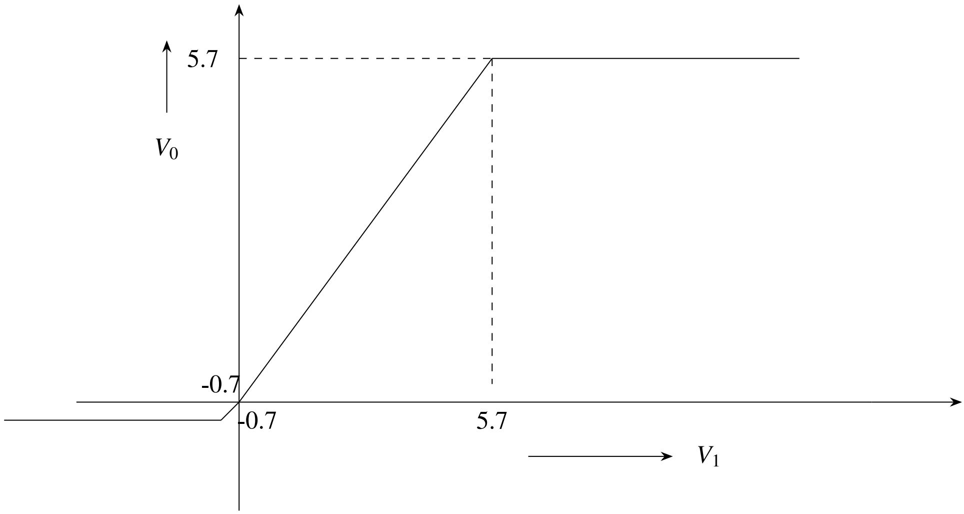
be 0.7 V, the input-output transfer characteristics of the circuit is



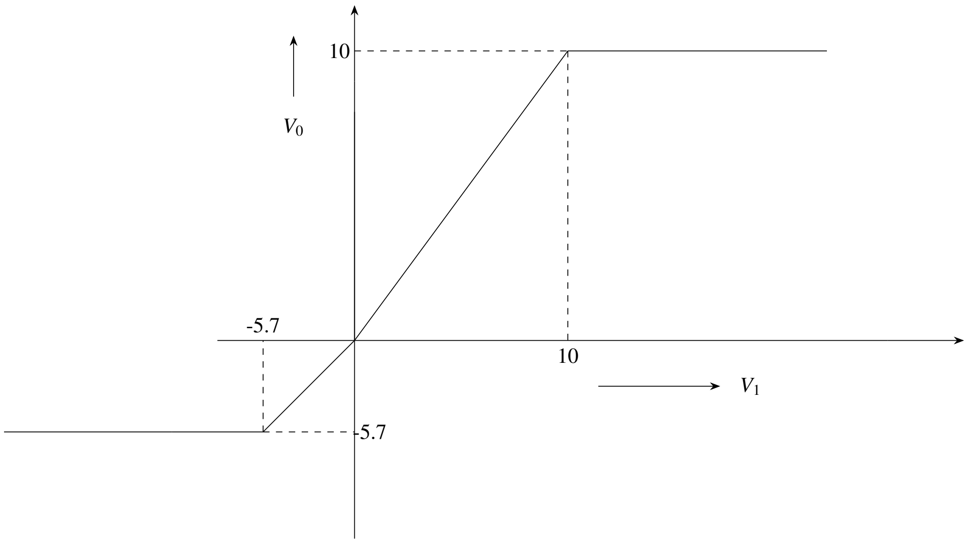
a)



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 $i_1 = (10\sqrt{2}\sin(100\pi t - \frac{\pi}{3}) + 5\sqrt{2}\sin(300\pi t + \frac{\pi}{4}) + 2\sqrt{2}\sin(500\pi t - \frac{\pi}{6}))A$

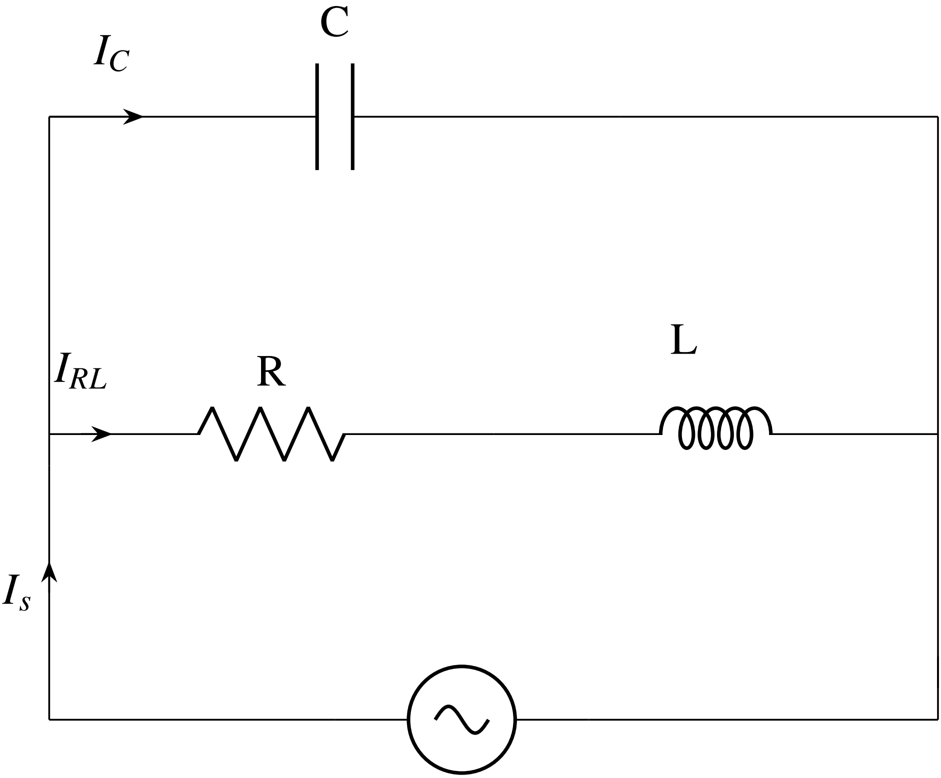
9) Then the power factor of the converter is

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: $V_S = 1\langle 0V$ $I_S = \sqrt{2}\langle\frac{\pi}{4}A$ $I_{RL} = \sqrt{2}\langle\frac{-\pi}{4}A$



11) The power dissipated in the resistor R

a) 0.5 W b) 1 W c) $\sqrt{2}W$ d) 2W

12) The current I_C in the figure above is

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