GATE EE-2009

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37) The z-transform of a signal $x[n]$ is given by $4z^{-3} + 3z^{-1} + 2 - 6z^2 + 2z^3$. It is applied to a system, with a transfer function $H[z] = 3z^{-1} - 2$. Let the output be $y[n]$. Which of the following is true?

a) $y(n)$ is non casual with finite support
b) $y(n)$ is casual with infinite support
c) $y(n) = 0; |n| > 3$
d) $Re[Y(z)]_{z=e^{j\theta}} = -Re[Y(z)]_{z=e^{-j\theta}}$; $Im[Y(z)]_{z=e^{j\theta}} = Im[Y(z)]_{z=e^{-j\theta}}$; $-\pi \leq \theta < \pi$

38) A cubic polynomial with real coefficients

a) can possible have no extrema and no zero crossings
b) may have up to three extrema and upto 2 zero crossings
c) cannot have more than two extrema and more than three zero crossings
d) will always have an equal number of extrema and zero crossings

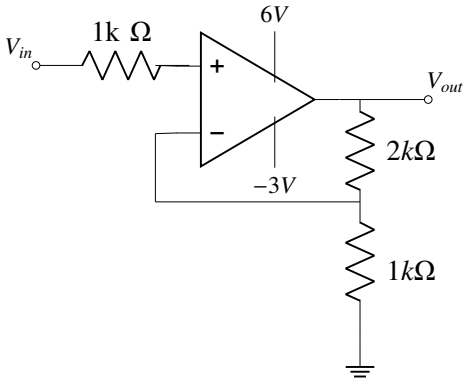
39) Let $x^2 - 117 = 0$. The iterative steps for the solution using Newton-Raphson's method is given by

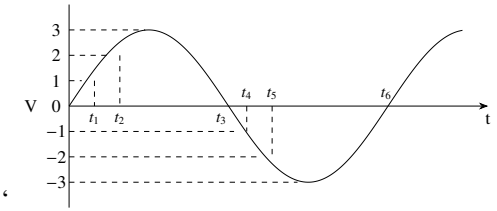
a) $x_{k+1} = \frac{1}{2}\left(x_k + \frac{117}{x_k}\right)$
b) $x_{k+1} = x_k - \frac{117}{x_k}$
c) $x_{k+1} = x_k - \frac{x_k}{117}$
d) $x_{k+1} = x_k - \frac{1}{2}\left(x_k + \frac{117}{x_k}\right)$

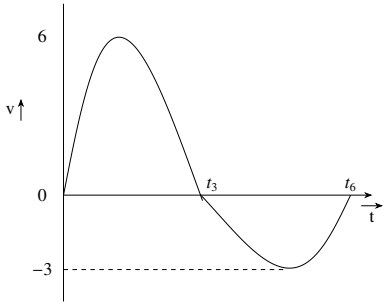
40) $F(x,y) = \left(x^2 + xy\right)\hat{a}_x + \left(y^2 + xy\right)\hat{a}_y$. It's line integral over the straight line from $(x,y) = (0,2)$ to $(x,y) = (2,0)$ evaluates to

a) -8 b) 4 c) 8 d) 0

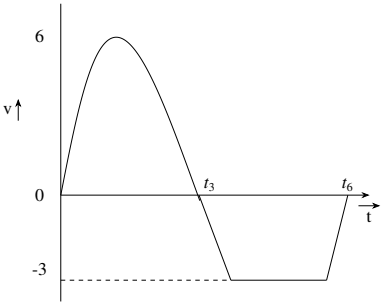
41) An ideal opamp circuit and its input waveform are shown in the figures. The output waveform of this circuit will be







a)



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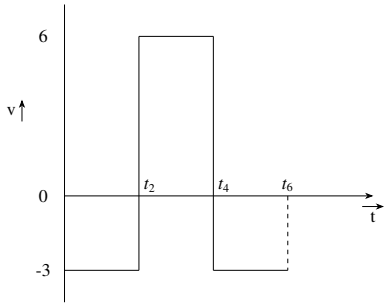
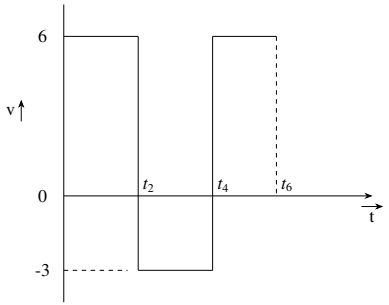
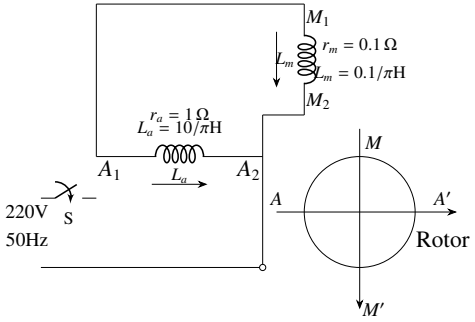


c)



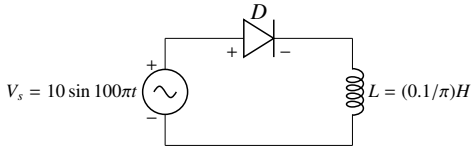
d)

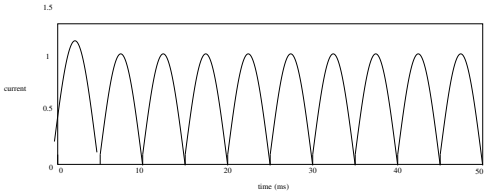
42) A 220V, 50 Hz, single-phase induction motor has the following connection diagram and winding orientations shown. MM' is the axis of the main stator winding. (M_1M_2) and AA' is that of the auxiliary winding (A_1A_2). Directions of the winding axes indicate direction of flux when currents in the windings are in the directions shown. Parameters of each winding are indicated. When switch S is closed, the motor



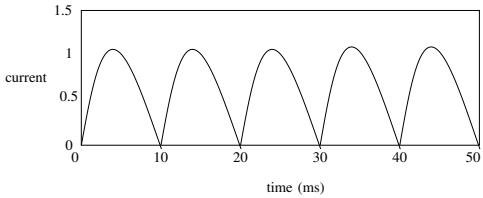
a) rotate clockwise
b) rotates anticlockwise
c) does not rotate
d) rotates and comes to a halt

43) The circuit shown an ideal diode connected to a pure inductor and is connected to a purely sinosoidal 50 Hz voltage source. Under ideal conditions the current waveform through the inductor will look like





a)



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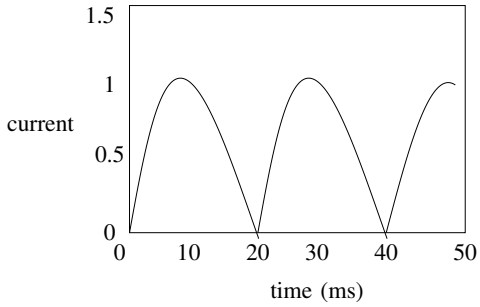
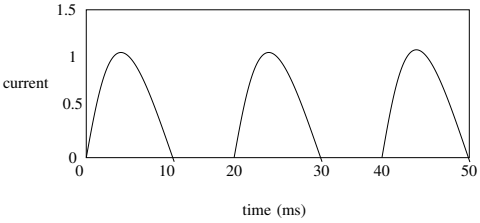
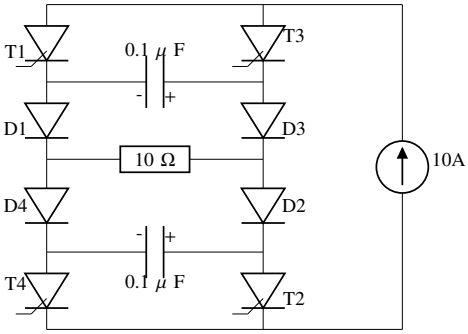


c)



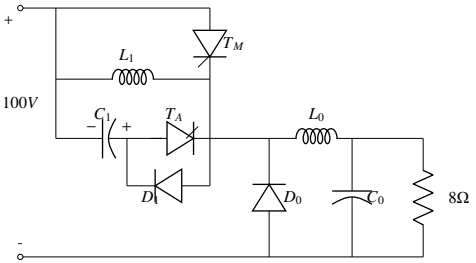
d)

44) The Current Source Inverter shown in figure is operated by alternately turning on thyristor pairs (T_1, T_2) and (T_3, T_4). If the load is purely resistive, the theoretical maximum output frequency obtainable will be



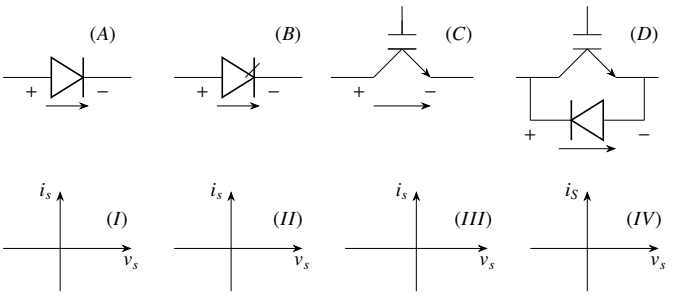
a) 125 kHz
b) 250 kHz
c) 500 kHz
d) 50 kHz

45) In the chopper circuit shown, the main thyristor (T_M) is operated at a duty ratio of 0.8 which is much larger the commutation interval. If the maximum allowable reapplied $\frac{dv}{dt}$ on T_M is $50V/\mu s$, what should be the theoretical minimum value of C_1? Assume current ripple through L_0 to be negligible.



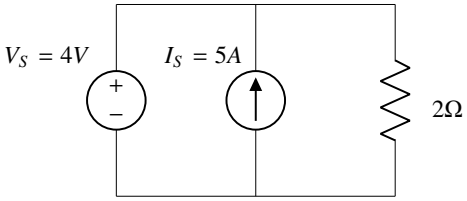
a) $0.2\mu F$
b) $0.02\mu F$
c) $2\mu F$
d) $20\mu F$

46) Match the switch arrangements on the top row to the steady-state V-I characteristics on the lower row. The steady state operating points are shown by large black dots



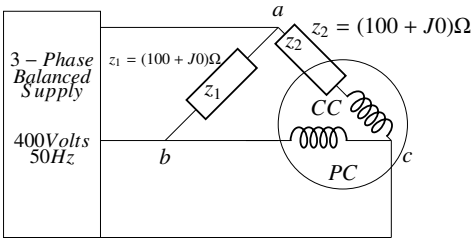
a) A-I, B-II, C- III, D- IV
b) A-II, B-IV, C- I, D- III
c) A-IV, B-III, C- I, D- II
d) A-IV, B-III, C- II, D- I

47) For the circuit shown, find out the current flowing through the 2Ω resistance. Also identify the changes to be made to double the current through the 2Ω resistance.



a) (5A; Put $V_S = 20$V)
b) (2A; Put $V_S = 8$V)
c) (5A; Put $I_S = 10$A)
d) (7A; Put $I_S = 12$A)

48) The figure shows a three-phase delta. connected load supplied from a 400V, 50 Hz, 3-phase balanced source. The pressure coil (PC) and current coil (CC) of a wattmeter are connected to the load as shown, with the coil polarities suitably selected to ensure a positive deflection. The wattmeter reading will



a) 0
b) 1600 Watt
c) 800 Watt
d) 400 Watt