

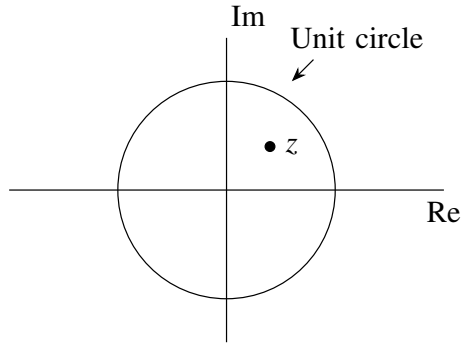
GATE - 2011 - EE

EE1030 : Matrix Theory
Indian Institute of Technology Hyderabad

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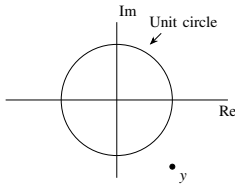
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1) A point z has been plotted in the complex plane, as shown in figure below.



The plot of the complex number $y = \frac{1}{z}$ is

- a)
 A complex plane with a horizontal real axis (Re) and a vertical imaginary axis (Im). A unit circle is centered at the origin, with an arrow pointing to it labeled "Unit circle". A point y is plotted in the first quadrant, inside the unit circle.
- b)
 A complex plane with a horizontal real axis (Re) and a vertical imaginary axis (Im). A unit circle is centered at the origin, with an arrow pointing to it labeled "Unit circle". A point y is plotted on the negative imaginary axis, inside the unit circle.
- c)
 A complex plane with a horizontal real axis (Re) and a vertical imaginary axis (Im). A unit circle is centered at the origin, with an arrow pointing to it labeled "Unit circle". A point y is plotted in the third quadrant, inside the unit circle.

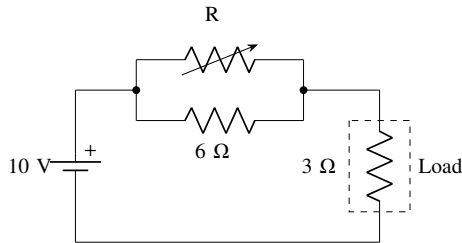


d)

2) The voltage applied to a circuit is $100\sqrt{2}\cos(100\pi t)$ volts and the circuit draws a current of $10\sqrt{2}\sin\left(100\pi t + \frac{\pi}{4}\right)$ amperes. Taking the voltage as the reference phasor, the phasor representation of the current in amperes is

- a) $10\sqrt{2}\angle -\frac{\pi}{4}$
- b) $10\angle -\frac{\pi}{4}$
- c) $10\angle +\frac{\pi}{4}$
- d) $10\sqrt{2}\angle +\frac{\pi}{4}$

3) In the circuit given below, the value of R required for the transfer of maximum power to the load having a resistance of $3\ \Omega$ is

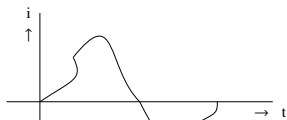


- a) zero
- b) $3\ \Omega$
- c) $6\ \Omega$
- d) infinity

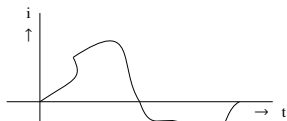
4) Given two continuous time signals $x(t) = e^{-t}$ and $y(t) = e^{-2t}$ which exist for $t > 0$, the convolution $z(t) = x(t) * y(t)$ is

- a) $e^{-t} - e^{-2t}$
- b) e^{-3t}
- c) e^{+t}
- d) $e^{-t} + e^{-2t}$

5) A single phase air core transformer, fed from a rated sinusoidal supply, is operating at no load. The steady state magnetizing current drawn by the transformer from the supply will have the waveform



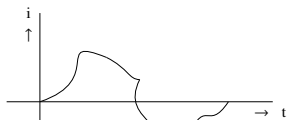
a)



b)



c)



d)

6) A negative sequence relay is commonly used to protect

- a) an alternator
- b) a transformer
- c) a transmission line
- d) a bus bar

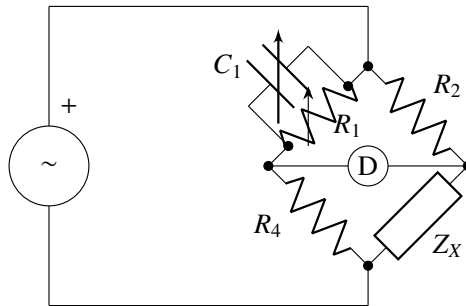
7) For enhancing the power transmission in along EHV transmission line, the most preferred method is to connect a

- a) series inductive compensator in the line
- b) shunt inductive compensator at the receiving end
- c) series capacitive compensator in the line
- d) shunt capacitive compensator at the sending end

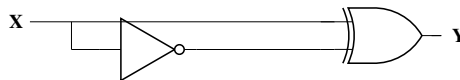
8) An open loop system represented by the transfer function $G(s) = \frac{(s-1)}{(s+2)(s+3)}$ is

- a) stable and of the minimum phase type
- b) stable and of the non - minimum phase type
- c) unstable and of the minimum phase type
- d) unstable and of non-minimum phase type

- 9) The bridge circuit shown in the figure below is used for the measurement of an unknown element Z_X . The bridge circuit is best suited when Z_X is a



- a) low resistance
 - b) high resistance
 - c) low Q inductor
 - d) lossy capacitor
- 10) A dual trace oscilloscope is set to operate in the ALTErnate mode. The control input of the multiplexer used in the y-circuit is fed with a signal having a frequency equal to
- a) the highest frequency that the multiplexer can operate properly
 - b) twice the frequency of the time base (sweep) oscillator
 - c) the frequency of the time base (sweep) oscillator
 - d) half the frequency of the time base (sweep) oscillator
- 11) The output **Y** of the logic circuit given below is



- a) 1
 - b) 0
 - c) \overline{X}
 - d) X
- 12) Circuit turn-off time of an SCR is defined as the time
- a) taken by the SCR turn of
 - b) required for the SCR current to become zero
 - c) for which the SCR is reverse biased by the commutation circuit
 - d) for which the SCR is reverse biased to reduce its current below the holding current

- 13) Solution of the variables x_1 and x_2 for the following equations is to be obtained by employing the Newton-Raphson iterative method.

equation (i) $10x_2 \sin(x_1) - 0.8 = 0$

equation (ii) $10x_2^2 - 10x_2 \cos(x_1) - 0.6 = 0$

Assuming the initial valued $x_1 = 0.0$ and $x_2 = 1.0$, the jacobian matrix is

a) $\begin{bmatrix} 10 & -0.8 \\ 0 & -0.6 \end{bmatrix}$

b) $\begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$

c) $\begin{bmatrix} 0 & -0.8 \\ 10 & -0.6 \end{bmatrix}$

d) $\begin{bmatrix} 10 & 0 \\ 10 & -10 \end{bmatrix}$