GATE - 2011 - EE

EE1030 : Matrix Theory
Indian Institute of Technology Hyderabad

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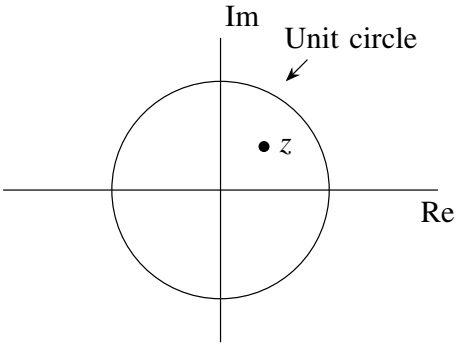
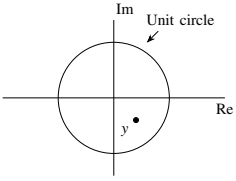
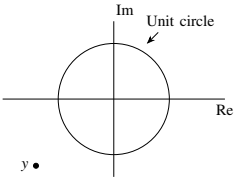
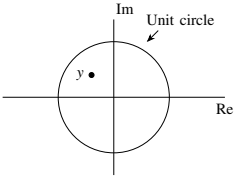
1) A point z has been plotted in the complex plane, as shown in figure below.

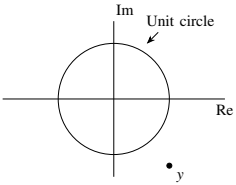


The plot of the complex number $y = \frac{1}{z}$ is

a)


b)


c)


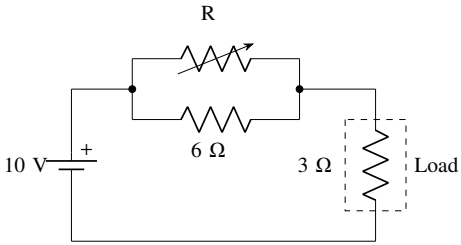


d)

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 Ω is



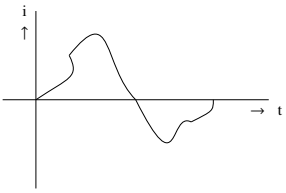
a) zero
b) 3 Ω
c) 6 Ω
d) infinity

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

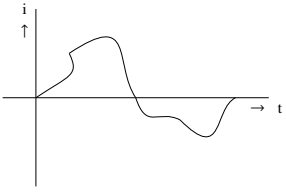
a) $e^{-t} - e^{-2t}$
b) e^{-3t}
c) e^{+t}
d) $e^{-t} + e^{-2t}$

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

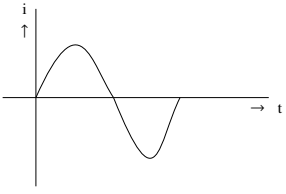
a)



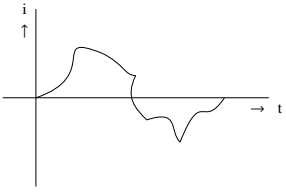
b)



c)



d)

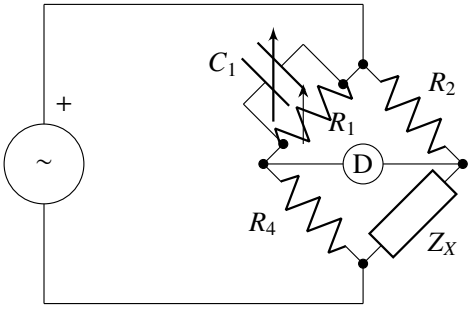


6) A negative sequence relay is commonly used to protect
   a) an alternator
   b) a transformer
   c) a transmission line
   d) a bus bar

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

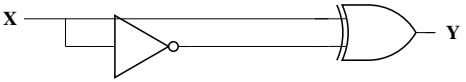


a) low resistance
b) high resistance
c) low Q inductor
d) lossy capacitor

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) haif the frequency of the time base (sweep) oscillator

11) The output **Y** of the logic circuit given below is



a) 1
b) 0
c) $\mathbf{X}$
d) $\overline{\mathbf{X}}$

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