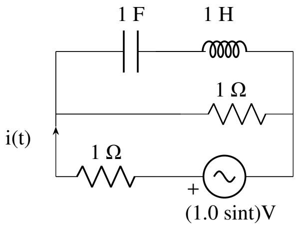
2011-EE-1-13

AI24BTECH11002 - K. Akshay Teja

1) Roots of the algebraic equation $x^3 + x^2 + x + 1 = 0$ are
   a) $(+l, +j, -j)$
   b) $(+1, -1, +1)$
   c) $(0, 0, 0)$
   d) $(-1, +j, -j)$

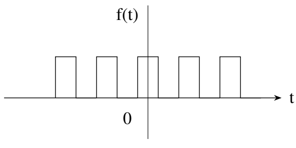
2) With K as a constant, the possible solution for the first-order differential equation $\frac{dy}{dx} = e^{-3x}$ is
   a) $-\frac{1}{3}e^{-3x} + K$
   b) $-\frac{1}{3}e^{3x} + K$
   c) $-3e^{-3x} + K$
   d) $-3e^{-x} + K$

3) The r.m.s. value of the current $i(t)$ in the circuit shown below is



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

4) The Fourier series expansion $f(t) = a_0 + \sum_{n=1}^{\infty} a_n \cos(n\omega t) + b_n \sin(n\omega t)$ of the periodic signal shown below will contain the following nonzero terms



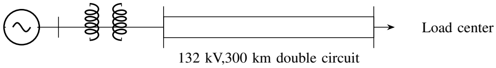
   a) a_0 and b_n, $n = 1, 3, 5, \ldots \infty$
   b) a_0 and a_n, $n = 1, 2, 3, \ldots \infty$
   c) a_0, a_n, and b_n, $n = 1, 2, 3, \ldots \infty$
   d) a_0 and a_n, $n = 1, 3, 5, \ldots \infty$

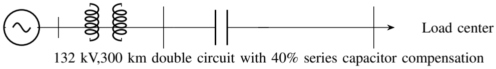
5) A 4-point starter is used to start and control the speed of a
   a) dc shunt motor with armature resistance control
   b) dc shunt motor with field weakening control
   c) dc series motor
   d) dc compound motor

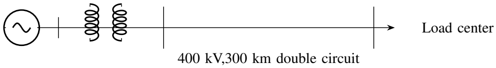
6) A three-phase, salient pole synchronous motor is connected to an infinite bus. It is operated at no load at normal excitation. The field excitation of the motor is first reduced to zero and then increased in the reverse direction gradually. Then the armature current

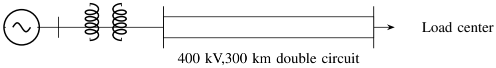
a) increases continuously
b) first increases and then decreases steeply
c) first decreases and then increases steeply
d) remains constant

7) A nuclear power station of 500 MW capacity is located at 300 km away from a load center. Select the most suitable power evacuation transmission configuration among the following options

a) 

b) 

c) 

d) 

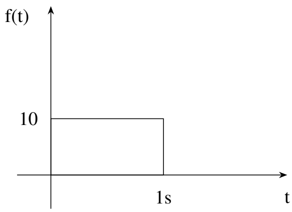
8) The frequency response of a linear system $G(j\omega)$ is provided in the tabular form below

$\lvert G(j\omega)\rvert$	1.3	1.2	1.0	0.8	0.5	0.3
$\angle G(j\omega)$	$-130°$	$-140°$	$-150°$	$-160°$	$-180°$	$-200°$

The gain margin and phase margin of the system are

a) 6 dB and 30°
b) 6 dB and $-30°$
c) -6 dB and 30°
d) -6 dB and $-30°$

9) The steady-state error of a unity feedback linear system for a unit step input is 0.1. The steady-state error of the same system, for a pulse input $r(t)$ having a magnitude of 10 and a duration of one second, as shown in the figure is



a) 0
b) 0.1
c) 1
d) 10

10) Consider the following statements:

(i) The compensating coil of a low power factor wattmeter compensates the effect of the impedance of the current coil.

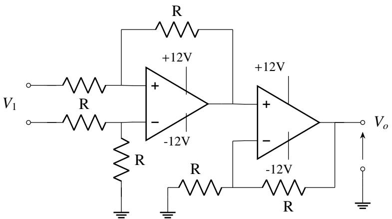
(ii) The compensating coil of a low power factor wattmeter compensates the effect of the impedance of the voltage coil circuit.

a) (i) is true but (ii) is false
b) (i) is false but (ii) is true
c) both (i) and (ii) are true
d) both (i) and (ii) are false

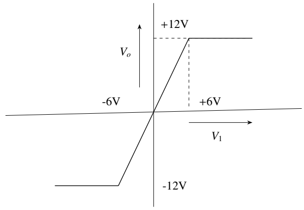
11) A low-pass filter with a cut-off frequency of 30 Hz is cascaded with a high-pass filter with a cut-off frequency of 20 Hz. The resultant system of filters will function as

a) an all-pass filter
b) an all-stop filter
c) a band stop (band-reject) filter
d) a band-pass filter

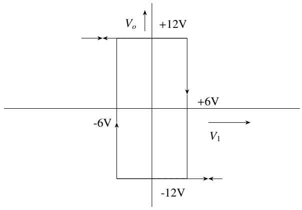
12) For the circuit shown below,



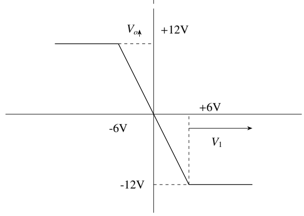
the CORRECT transfer characteristic is



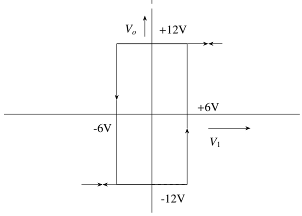
a)



c)

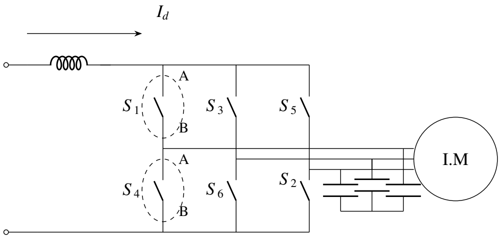


b)

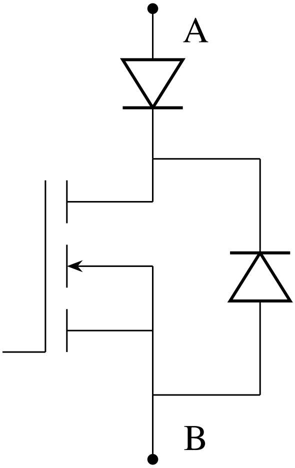


d)

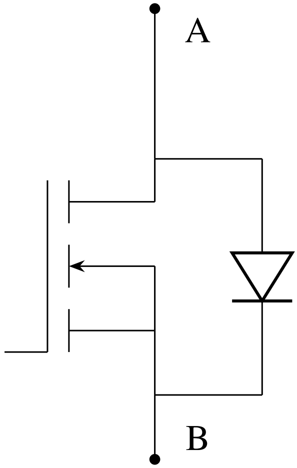
13) A three-phase current source inverter used for the speed control of an induction motor is to be realized using MOSFET switches as shown below. Switches S_1 to S_6 are identical switches.



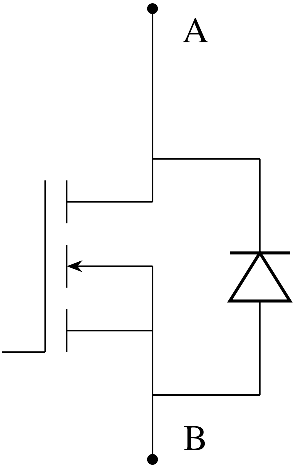
The proper configuration for realizing switches S_1 to S_6 is



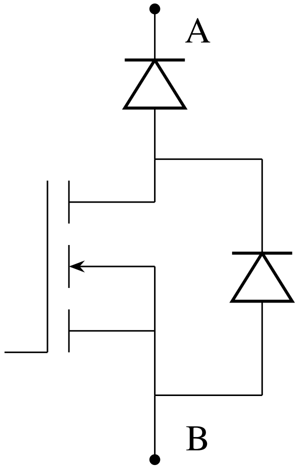
a)



c)



b)



d)