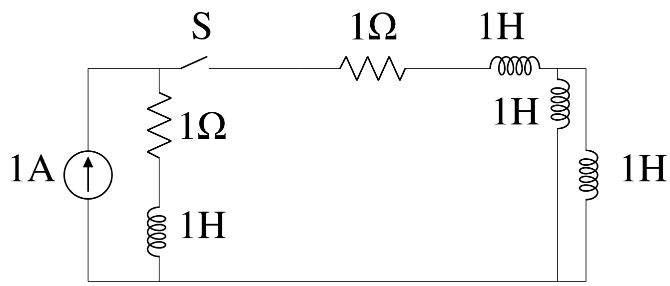
2018-EE-53-65

AI24BTEC11027 - R Sumanth

1) The circuit shown in the figure with the switch S open, is in steady state. After the switch S is closed, the time constant of the circuit in seconds is



   a) 1.25
   b) 0
   c) 1
   d) 1.5

2) Suppose signal $y(t)$ is obtained by the time-reversal of signal $x(t)$, i.e., $y(t) = x(-t), -\infty < t < \infty$. Which one of the following options is always true for the convolution of $x(t)$ and $y(t)$?
   a) It is an even signal.
   b) It is an odd signal.
   c) It is a causal signal.
   d) It is an anti-causal signal.

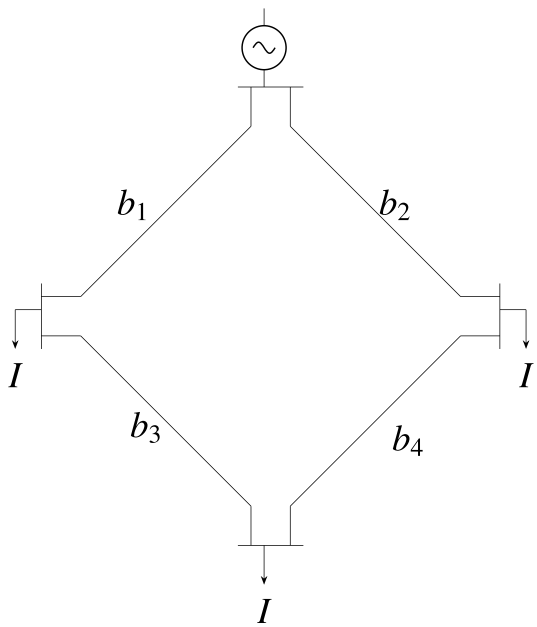
3) If $u(t)$ is the unit step function, then the region of convergence (ROC) of the Laplace transform of the signal $x(t) = e^{t^2}[u(t-1) - u(t-10)]$ is
   a) $-\infty < Re(s) < \infty$
   b) $Re(s) \geq 10$
   c) $Re(s) \leq 1$
   d) $1 \leq Re(s) \leq 10$

4) A three phase, $50Hz$, 6 pole induction motor runs at $960rpm$. The stator copper loss, core loss, and the rotational loss of the motor can be neglected. The percentage efficiency of the motor is
   a) 92
   b) 94
   c) 96
   d) 98

5) Which of the following complex functions is/are analytic on the complex plane?
   a) $f(z) = jRe(z)$
   b) $Im(z)$
   c) $f(z) = e^{|z|}$

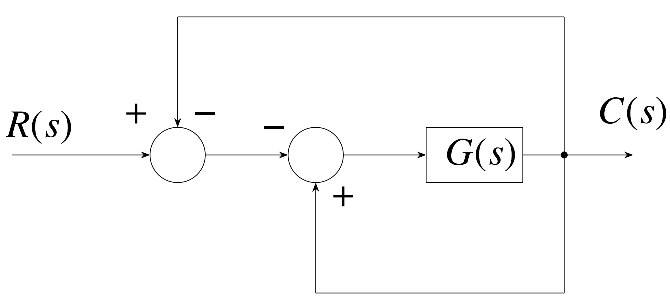
d) $f(z) = z^2 - z$

6) The figure shows the single line diagram of a 4-bus power network. Branches b_1, b_2, b_3, and b_4 have impedances 4_z,z ,2_z, and 4_z per-unit (pu), respectively, where $z = r + jx$, with $r > 0$ and $x > 0$. The current drawn from each load bus (marked as arrows) is equal to I pu, where $I \neq 0$. If the network is to operate with minimum loss, the branch that should be opened is



a) b_1
b) b_2
c) b_3
d) b_4

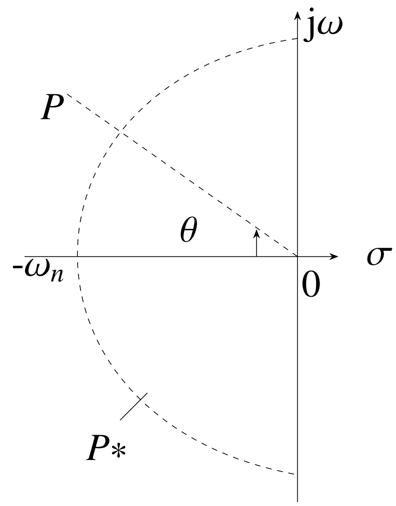
7) For the block-diagram shown in the figure, the transfer function $\frac{C(s)}{R(s)}$ is



a) $\frac{G(s)}{1+2G(s)}$
b) $-\frac{G(s)}{1+2G(s)}$
c) $\frac{G(s)}{1-2G(s)}$
d) $-\frac{G(s)}{1-2G(s)}$

8) Consider the standard second-order system of the form $\frac{\omega_n^2}{s^2+2\zeta\omega_n s+\omega_n^2}$ with the poles p and $p*$ having negative real parts. The pole locations are also shown in the figure. Now consider two such second-order systems as defined below:

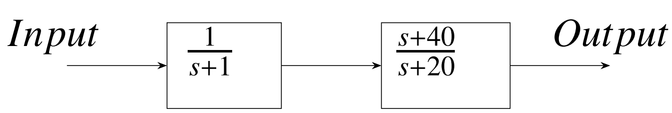
System 1: $\omega_n = 3rad/second\theta = 60°$
System 2: $\omega_n = 1rad/second\theta = 70°$



Which one of the following statements is correct?

a) Settling time of System 1 is more than that of System 2.
b) Settling time of System 2 is more than that of System 1.
c) Settling times of both the systems are the same.
d) Settling time cannot be computed from the given information.

9) Consider the cascaded system as shown in the figure. Neglecting the faster component of the transient response, which one of the following options is a first order pole-only approximation such that the steady-state values of the unit step responses of the original and the approximated systems are same?



a) $\frac{1}{s+1}$
b) $\frac{2}{s+1}$
c) $\frac{1}{s+20}$
d) $\frac{2}{s+20}$

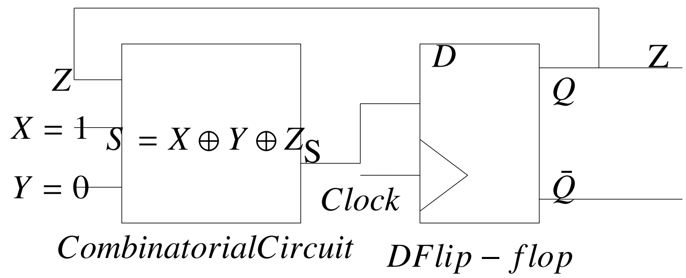
10) The table lists two instrument transformers and their features:

Instrument Transformers	**Features**
	P) Primary is connected in parallel to the grid
X) Current Transformer (CT)	Q) Open circuited secondary is not desirable
Y) Potential Transformer (PT)	R) Primary current is the line current
	S) Secondary burden affects the primary current

a) X matches with P and Q; Y matches with R and S.
b) X matches with P and R; Y matches with Q and S.
c) X matches with Q and R; Y matches with P and S.
d) X matches with Q and S; Y matches with P and R.

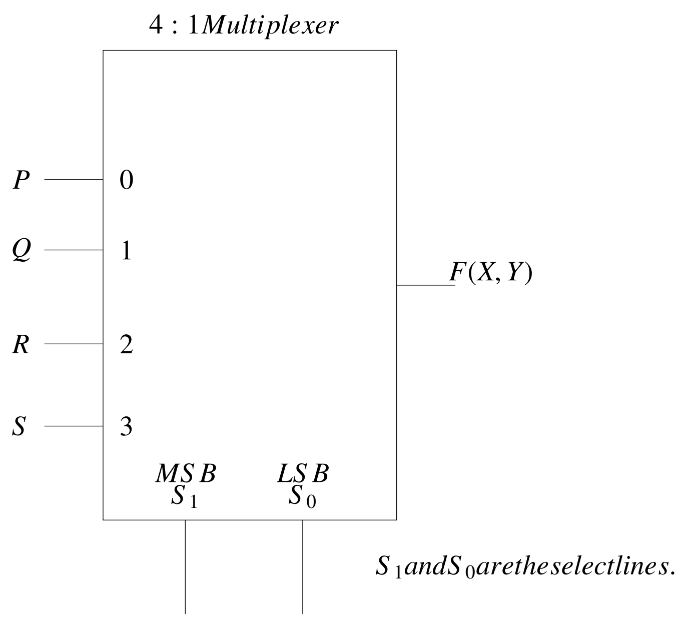
11) Simplified form of the Boolean function
$F(P, Q, R, S) = \bar{P}\bar{Q} + \bar{P}QS + P\bar{Q}\bar{R}\bar{S} + P\bar{Q}R\bar{S}$
is
a) $\bar{P}S + \bar{Q}\bar{S}$
b) $\bar{P}\bar{Q} + \bar{Q}\bar{S}$
c) $\bar{P}Q + R\bar{S}$
d) $p\bar{S} + Q\bar{R}$

12) In the circuit, the present value of Z is 1. Neglecting the delay in the combinatorial circuit, the values of S and Z, respectively, after the application of the clock will be



a) $S = 0, Z = 0$
b) $S = 0, Z = 1$
c) $S = 1, Z = 0$
d) $S = 1, Z = 1$

13) To obtain the Boolean function $F()X, Y = X\bar{Y} + \bar{X}$ the inputs $PQRS$ in the figure should be



a) 1010
b) 1110
c) 0110
d) 0001