LONG ASSIGNMENT-2 (EE 101: Basic Electronics)

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To be submitted on 14th Nov, 19 (Thursday)

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1. A three-phase, 440 volt (rms) source supplies a load with an equivalent star connected impedance of (60 + j15) Ω per phase through a transmission line of impedance (0.3 + j1.0) Ω per phase. Compute (a) line current, (b) the voltage across the load, (c) the real power (in KW) consumed by the load, (d) the reactive power (in KVAR) consumed by the load, (e) the power (in KW) loss in the line and (f) the total KVA supplied by the source.

2. In the balanced three-phase system of Fig. 1, the load impedance $Z_P = 10+j7\ \Omega$. Assume positive (+) phase sequence, find if $W_1 > W_2$ or $W_2 > W_1$. If the source is operating with a power factor of **0.96** and $W_1 = 15$ *kW*, find the values of (a) R_W, (b) W_2, (c) total real power absorbed by the load and (d) the reactive power supplied to the load.

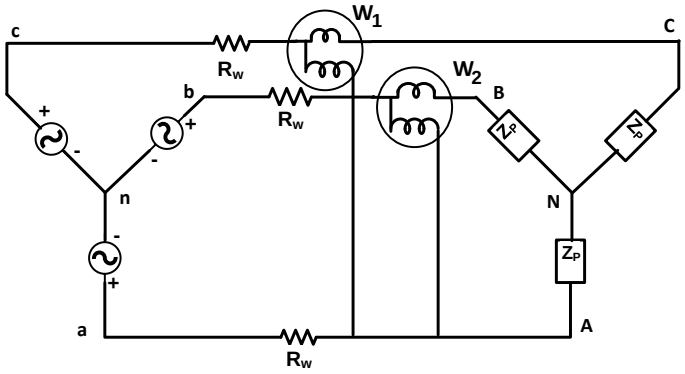


Fig. 1

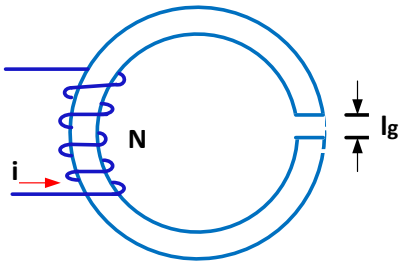


Fig. 2

3. An electromagnet of square cross section (2×2 cm2), shown in Fig. 2, has a coil of N = 1800 turns. The inner and the outer radii of the core are 10 cm and 12 cm respectively and the air gap length (l_g) is 2 cm. The current in the coil is i=4 A and the relative permeability of the core material is 1200. Determine the total reluctance and the flux density in the core.

4. Let i_S = 2 cos (10t) A in the circuit shown in Fig. 3. Find the total energy stored if (a) a-b is open circuited, (b) a-b is short circuited.

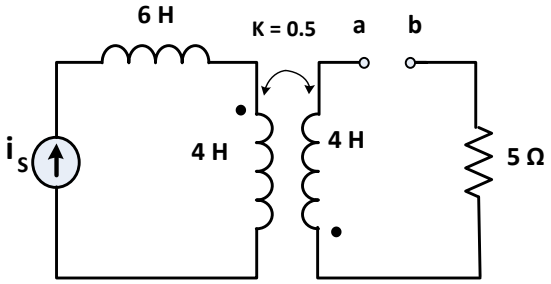


Fig. 3

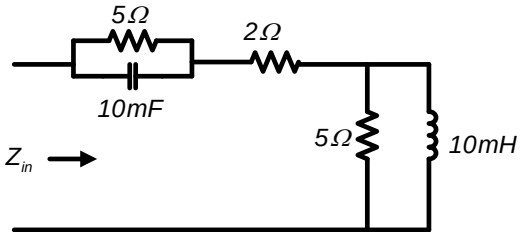


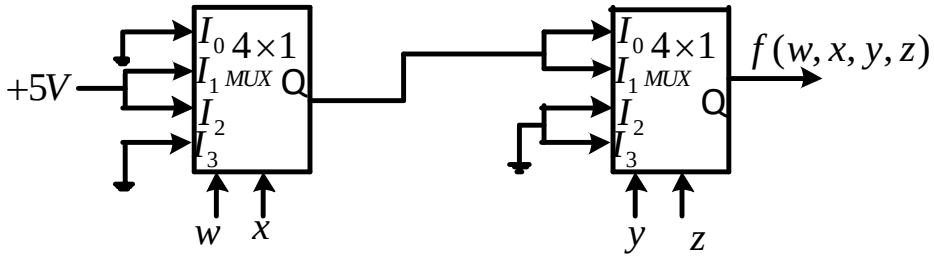
Fig. 4

5. For the network shown in Fig. 4, find (a) the resonant frequency ω_0 and (b) $Z_{in}(j\omega_0)$.

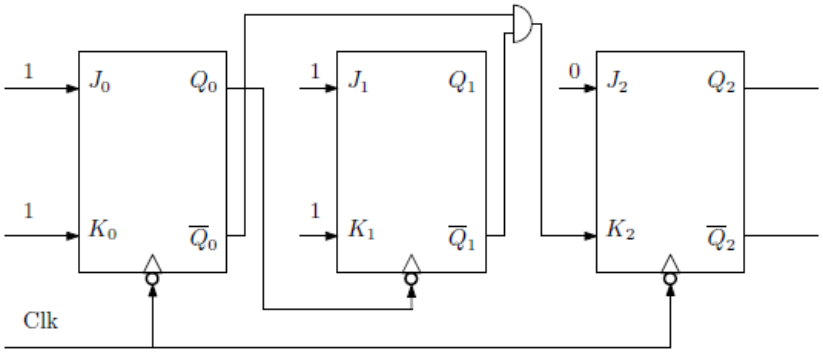
6. A certain four-input gate, called a LEMON gate, realizes the Boolean function $LEMON(A,B,C,D) = BC(A+D)$. Assume that the input variables are available in both complemented and uncomplemented form. Show a realization of the function $f(w,x,y,z) = \sum m(0,1,6,9,10,11,14,15)$.

7. Design a 2-bit× 2-bit multiplier circuit and implement using decoder.

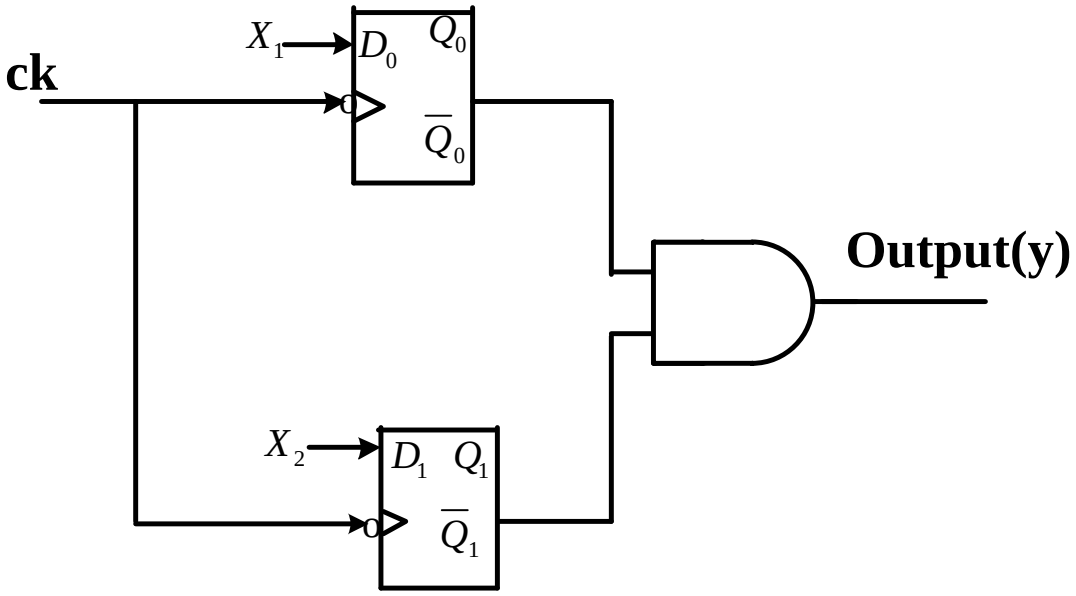
8. In the circuit shown below, w and y are the MSBs of the selection inputs. Determine the Boolean expression for $f(w,x,y,z)$

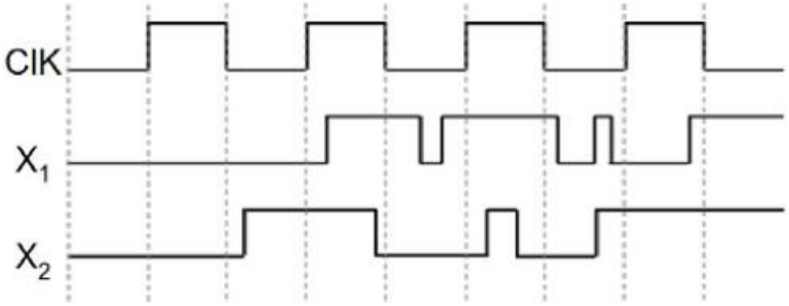


9. In the counter circuit shown below, the flip-flops trigger on negative edge of clock signal. Assuming that the initial state $Q_2\,Q_1\,Q_0 = 100$, determine the count sequence of the circuit.



10. In the circuit shown below, derive the timing diagram of output (*y*). Note that the flip-flops are negative edge triggered.


ck
X_1
D_0
Q_0
$\overline{Q}_0$
Output(y)
X_2
D_1
Q_1
$\overline{Q}_1$


CIK
X_1
X_2