AI1103: Assignment 9

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Download latex-tikz codes from

https://github.com/tanmaygar/AI−Course/blob/main/Assignment9/Assignment9.tex

PROBLEM CSIR UGC NET EXAM (JUNE 2016), Q.118:

Three types of components are used in electrical circuits 1, 2, 3 as shown below in the figure

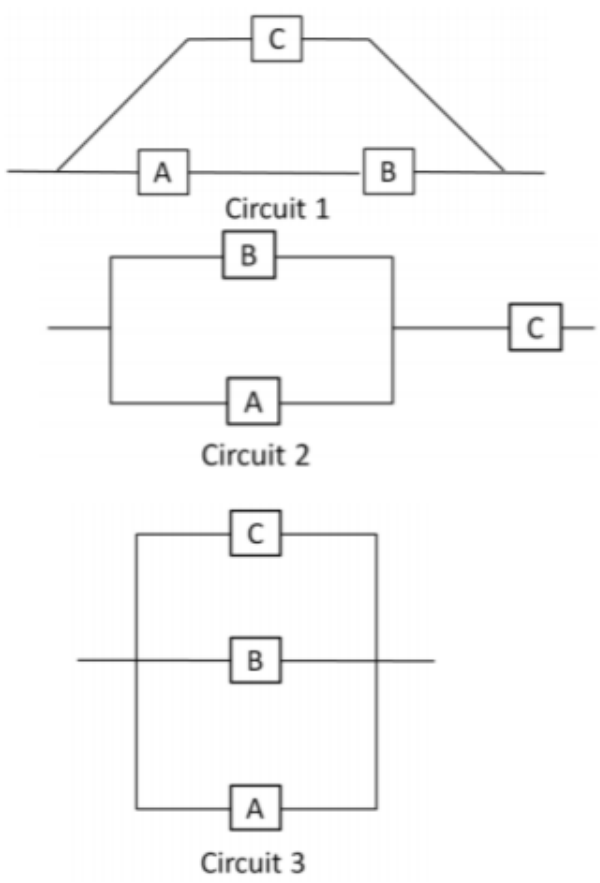


Fig. 0: Figure

Suppose that each of the three components fail with probability p and independently of each other. Let q_i = Pr (Circuit i does not fail); $i = 1, 2, 3$ For $0 < p < 1$, we have

1) $q_3 > q_1$
2) $q_2 = q_1$
3) $q_2 > q_1$
4) $q_2 > q_3$

SOLUTION:

For q_1, the truth table

A	B	C	$(AB) + C$
1	1	0	1
1	1	1	1
0	1	1	1
0	0	1	1
1	0	1	1

TABLE 4: Circuit 1 working

Multiplying and adding probability for each case of q_1 gives us the value of q_1 as

$$q_1 = p^3 - 2p^2 + 1 \tag{0.0.1}$$

For q_2, the truth table

A	B	C	$(A + B)C$
1	1	1	1
1	0	1	1
0	1	1	1

TABLE 4: Circuit 2 working

Multiplying and adding probability for each case of q_2 gives us the value of q_2 as

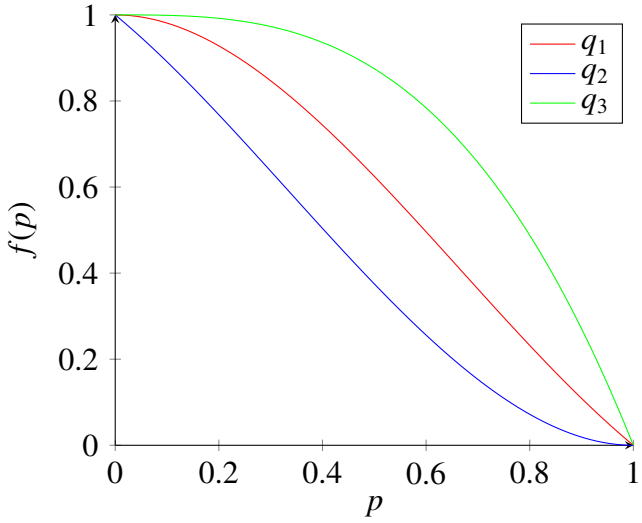
$$q_2 = p^3 - p^2 - p + 1 \tag{0.0.2}$$

For q_3, the truth table
Multiplying and adding probability for each case of q_3 gives us the value of q_3 as

$$q_3 = 1 - p^3 \tag{0.0.3}$$

A	B	C	$A+B+C$
1	0	0	1
0	1	0	1
0	0	1	1
1	1	0	1
1	0	1	1
0	1	1	1
1	1	1	1

TABLE 4: Circuit 3 working



$$\therefore q_3 > q_1 > q_2 \tag{0.0.4}$$

Hence **Option 1** is correct