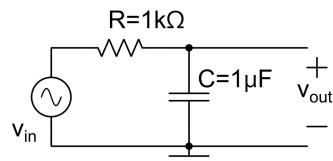


NAME (in capital)

Roll No:

1) : Choose the correct closest answer by shading ■ the appropriate box.



$v_{in} = 1 \text{ V} \sin(\omega t)$. Find v_{out} if $\omega = 1 \text{ krad/s}$.

- $0.7 \text{ V} \sin(\omega t + \pi/4)$
- $0.7 \text{ V} \sin(\omega t - \pi/4)$
- $0.8 \text{ V} \sin(\omega t + \pi/4)$
- $0.8 \text{ V} \sin(\omega t - \pi/4)$

$$\frac{v_{out}}{\sqrt{v_{in}}} = \frac{1}{1_f j\omega RC}$$

$$R (= 1 \text{ krad/s}) \cdot \phi = -\frac{\pi}{4}$$

$$1 \frac{v_{out}}{v_{in}} = \frac{1}{\sqrt{2}}$$

2) : N is a 2's complement representation of a binary number. How many minimum number of bits must N have to correctly represent a range of decimal equivalent of -120 to $+100$? Choose the correct answer by shading ■ the appropriate box. [3]

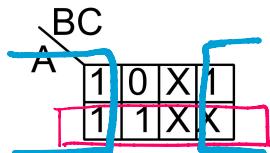
- 7
- 8
- 6
- 9

Has to cover 221 levels.

$$\therefore 2^7 < 221 < 2^8$$

∴ At least 8 bits are reqd.

3) : Write the shortest expression of the output in the POS form in the space provided. [5]

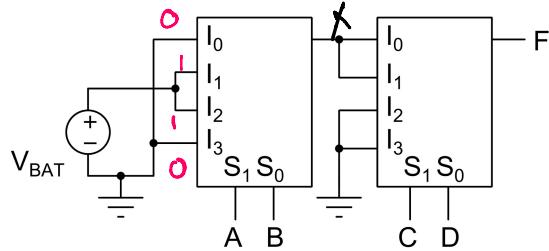


A + C̄

NAME (in capital)

Roll No:

4) : Select the correct expressions for F by shading ■ the appropriate boxes. The symbol of the MUX has its usual meanings and $V_{BAT} > V_{IH}$ for all logic gates. [4]



$$f = \bar{x} \bar{c}$$

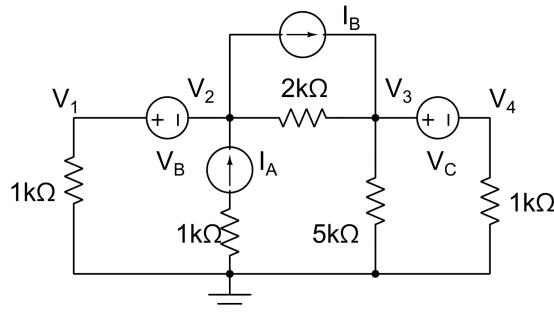
- $(AB + \bar{A}\bar{B})\bar{C}$
- $(AB + \bar{A}B)(\bar{C}\bar{D} + \bar{C}D)$
- $(\bar{A}\bar{B} + \bar{A}B)C$
- $(\bar{A}\bar{B} + \bar{A}B)(\bar{C}\bar{D} + \bar{C}D)$

$$x = A\bar{B} + \bar{A}B$$

$$\therefore f = (\bar{A}\bar{B} + \bar{A}B)\bar{C}$$

$$\text{Also } \bar{c} = \bar{C}\bar{D} + \bar{C}D.$$

5) : Consider the following network. The nodal equations are represented in the form of a matrix as shown below. [5]



Error in the
matrix column.
Marks granted to ALL.

$$\begin{bmatrix} - & - & - & - \\ g_{21} & g_{22} & g_{23} & g_{24} \\ - & - & - & - \\ - & - & - & - \end{bmatrix} \cdot \begin{bmatrix} V_1 \\ V_2 \\ V_3 \\ V_4 \end{bmatrix} = \begin{bmatrix} 0 \\ I_x \\ -I_B \\ 0 \end{bmatrix}$$

Find $g_{21}, g_{22}, g_{23}, g_{24}$ in mS and I_x in terms of other sources and write your answer in the space provided.

$$g_{21} = \boxed{\quad}, g_{22} = \boxed{\quad}, g_{23} = \boxed{\quad}$$

$$g_{24} = \boxed{\quad}, I_x = \boxed{\quad}$$

NAME (in capital)

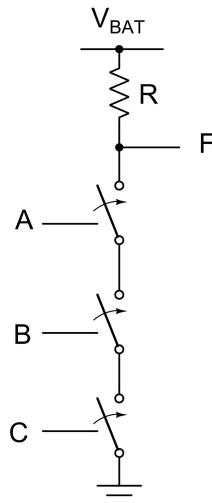
Roll No:

6) : A network comprises of resistors, diodes, one capacitor and one voltage source, $V_{in} = \exp(j\omega t)$. The voltage across the capacitor can always be expressed as $H(j\omega) \exp(j\omega t)$, where $H(j\omega)$ is independent of t . Select the correct answer by shading ■ the appropriate box. [2]

- The statement is true
- The statement is false

The statement is true only for LTI systems. Diode is a non-linear element.

7) : Find the logical relation between A, B, C and the output F. Assume the switches are ideal and turn on when the control terminal goes to logical high. Select the correct answers by shading ■ the appropriate boxes. [3]



- \overline{ABC}
- $\overline{A}\overline{B}\overline{C}$
- $\overline{A+B+C}$
- $\overline{A} + \overline{B} + \overline{C}$

$$\therefore F = \overline{ABC}$$

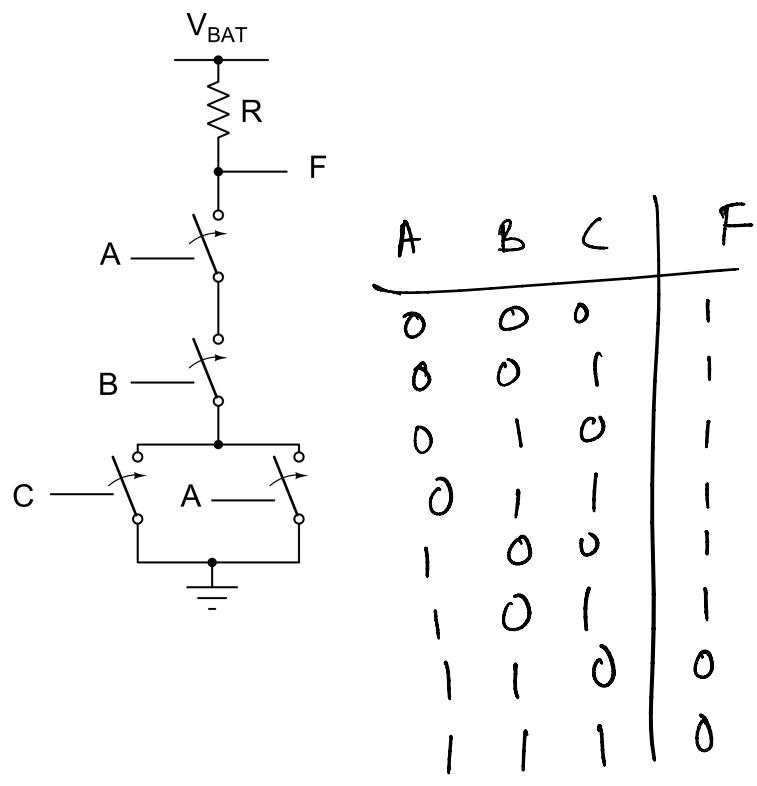
$$= \overline{A} + \overline{B} + \overline{C}$$

A	B	C	F
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

NAME (in capital)

Roll No:

8) : Find the logical relation between A, B, C and the output F. Assume the switches are ideal and turn on when the control terminal goes to logical high. Select the correct answers by shading ■ the appropriate boxes. [4]



- \overline{ABC}
- \overline{AB}
- $\overline{A} + \overline{B} + \overline{C}$
- $\overline{A} + \overline{B} + \overline{C}$
- $\overline{AB} + \overline{C}$

$$F = \overline{AB}$$