Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2013/2014

COURSE NAME	:	ELECTRICAL AND ELECTRONIC TECHNOLOGY
COURSE CODE	:	BDA 14303 / BEX17003
PROGRAMME	:	1 BDA
EXAMINATION DATE	:	JUNE 2014
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS. PART A: MULTIPLE CHOICE QUESTION. WRITE ANSWER IN THE ANSWER SHEET (PAGE 8) PART B: STRUCTURED QUESTION. ANSWER IN THE PROVIDED SPACE.

THIS QUESTION PAPER CONSISTS OF **NINETEEN (19)** PAGES

PART A: MULTIPLE CHOICE QUESTION

(1 mark each)

Q1 An electric heater draws 10 A from a 120V line. Determine the resistance of the heater.

(a) 1200 Ω

(b) 12 Ω

(c) 120 Ω

(d) 1.2 Ω

Q2 A toaster in connected to a 240V line. If the resistance is 1000 Ω, calculate the power consumption.

(a) 0.24W

(b) 57.6W

(c) 4.167W

(d) Undetermined

Figure Q3 is for question **Q3**, **Q4** and **Q5**

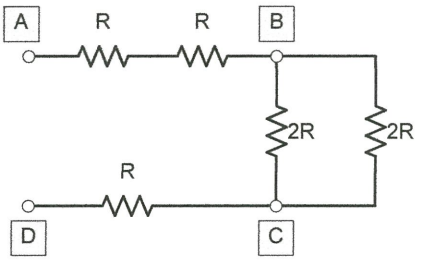


FIGURE Q3

Q3 Determine the total resistance for the circuit in Figure Q3 at terminal A-C?

(a) 2 R

(b) 3 R

(c) 2.5 R

(d) None above

Q4 Determine the total resistance for the circuit in Figure Q3 at terminal B-D?

(a) 2 R

(b) 3 R

(c) 2.5 R

(d) None above

Q5 Determine the total resistance for the circuit in Figure Q3 at terminal A-D?

(a) 3 R

(b) 4 R

(c) 3.5 R

(d) None above

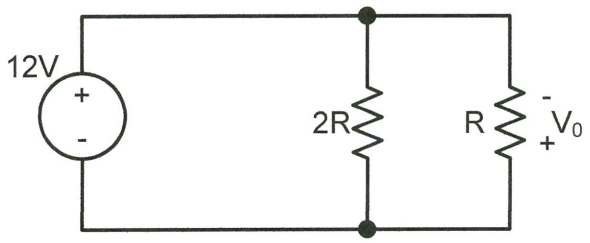


FIGURE Q6

Q6 Determine the V_0 for circuit in Figure Q6.

(a) 12 V

(b) More than 12 V

(c) Less than 12V

(d) None above

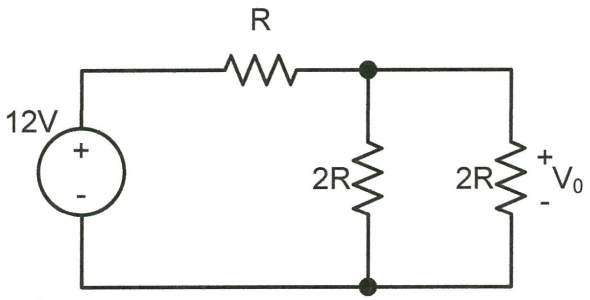


FIGURE Q7

Q7 Determine the V_0 for circuit in Figure Q7.

(a) 6 V

(b) 3 V

(c) 12V

(d) None above

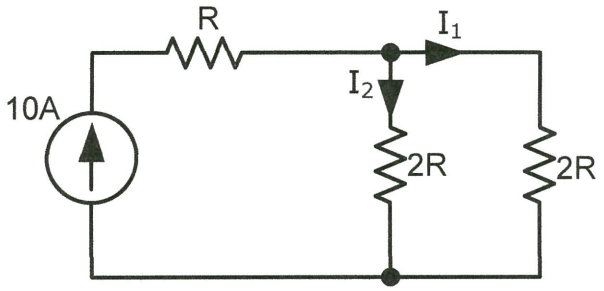


FIGURE Q8

Q8 Determine the I_2 for circuit in Figure Q8.

(a) 10 A

(b) 5 A

(c) -10 A

(d) None above

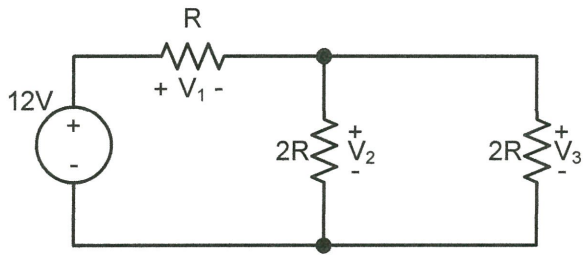


FIGURE Q9

Q9 Deduce the relation between V_1, V_2 and V_3 for the circuit in Figure Q9.

(a) $V_1 > V_2 > V_3$

(b) $V_1 < V_2 = V_3$

(c) $V_1 = V_2 = V_3$

(d) None above

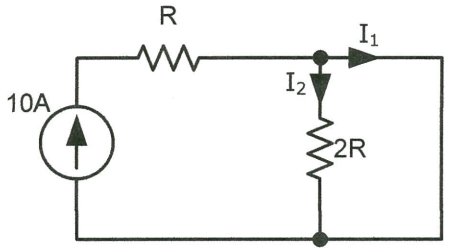


FIGURE Q10

Q10 Determine the I_2 for circuit in Figure Q10.

(a) 10 A

(b) 5 A

(c) -10 A

(d) None above

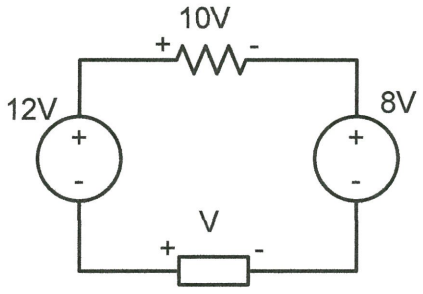


FIGURE Q11

Q11 Determine V for circuit in Figure Q11.

(a) 30 V

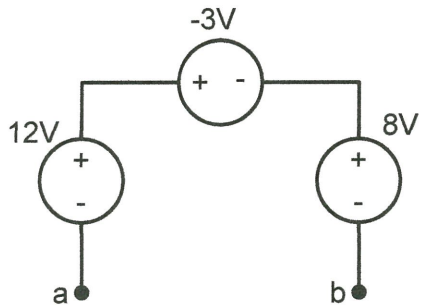
(b) 14 V

(c) 10 V

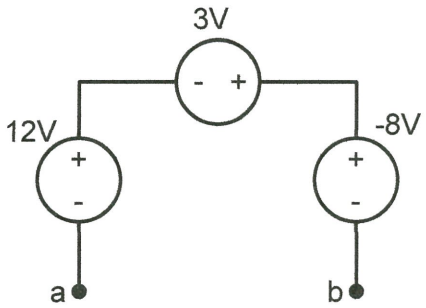
(d) 6 V

Q12 Determine which of the circuit below will give V_{ab}=7V.

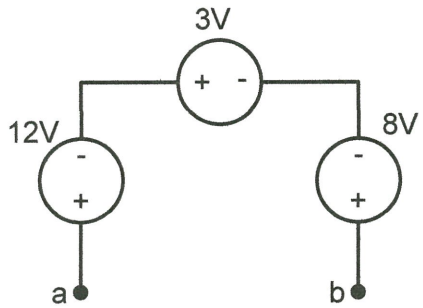
(a)



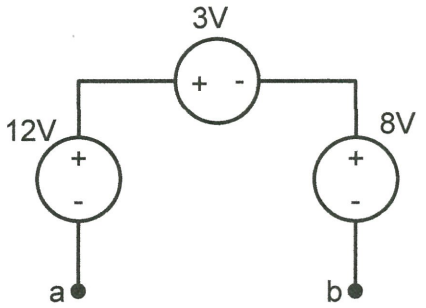
(c)



(b)



(d)



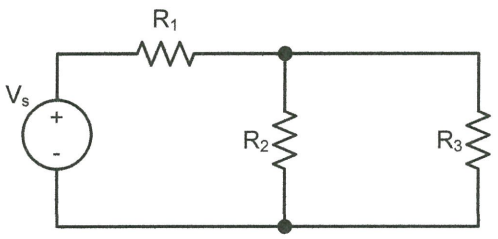


FIGURE Q13

Q13 Which of the value below will decrease if the value of R_3 for circuit in Figure Q13 decreases?

(a) Current through R_3

(b) Voltage across R_3

(c) Voltage across R_1

(d) None above

Q14 Which of the following is the correct method for obtaining Thevenin resistance?

(a) Both voltage and current source are 'open'

(b) Voltage source are 'shorted' and current source are 'open'.

(c) Voltage source are 'open' and current source are 'shorted'.

(d) Both voltage and current source are 'shorted'

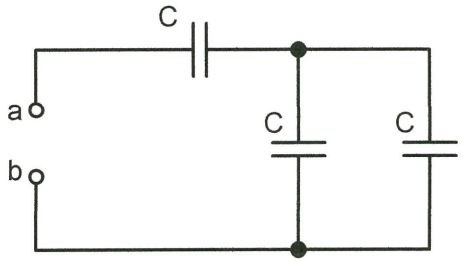


FIGURE Q15

Q15 Determine the total capacitance for circuit in Figure Q15.

(a) 0.5 C

(b) 1 C

(c) 1.5 C

(d) None above

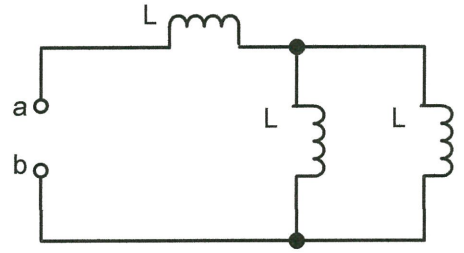


FIGURE Q16

Q16 Determine the total inductance for circuit in Figure Q16.

(a) 0.5 L

(b) 1 L

(c) 1.5 L

(d) None above

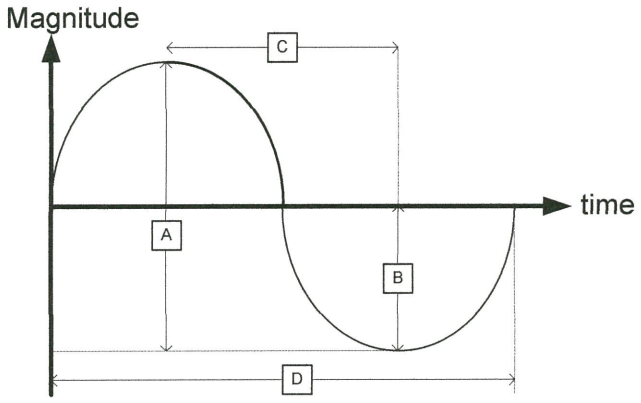


FIGURE Q17

17. Figure Q17 shows a typical alternate current waveform. Identify the amplitude.

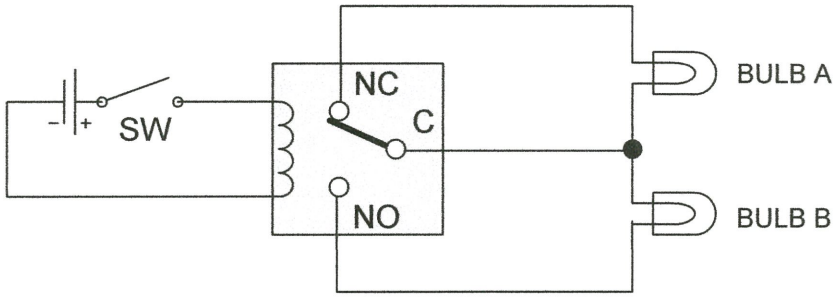


FIGURE 18

Q18 Deduce what happen to both bulb in circuit in Figure Q18 when switch 'SW' is closed

(a) Both 'ON'

(b) Bulb A 'ON'; Bulb B 'OFF'

(c) Bulb A 'OFF'; Bulb B 'ON'

(d) Both 'OFF'

Q19 A transformer **CANNOT** be used to change the value of

(a) Voltage

(b) Power

(c) Current

(d) None above

Q20 Determine which of the following electric motor is **NOT** an alternate current motor?

(a) Stepper motor

(b) Induction motor

(c) Synchronous motor

(d) None above

PART A (ANSWER SHEET)

Q1		Q11	
Q2		Q12	
Q3		Q13	
Q4		Q14	
Q5		Q15	
Q6		Q16	
Q7		Q17	
Q8		Q18	
Q9		Q19	
Q10		Q20	

PART B: STRUCTURED QUESTION

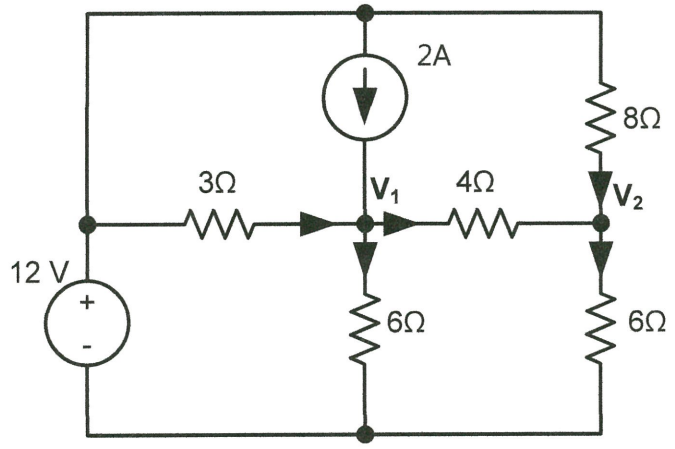


FIGURE Q21

Q21 (a) Applying KCL at node V_1 for circuit in Figure Q21 gives:

(5 marks)

(b) Applying KCL at node V_2 for circuit in Figure Q21 gives:

(5 marks)

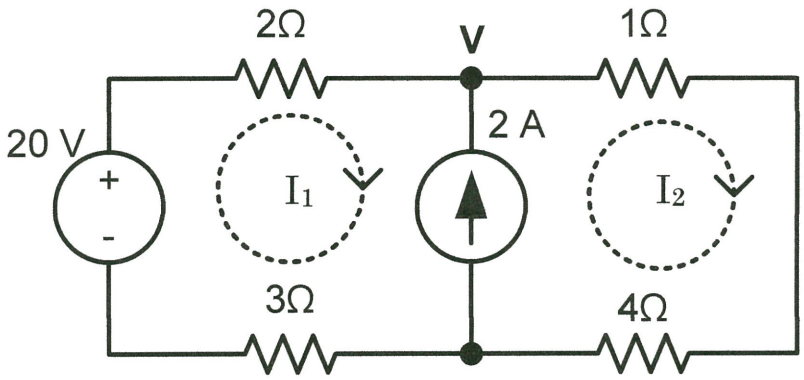


FIGURE Q22

Q22 (a) Calculate I_1 for circuit in Figure Q22.

(5 marks)

(b) Calculate V for circuit in Figure Q22.

(5 marks)

Q23 Calculate V_L for circuit in Figure Q23, Show all steps.

(10 marks)

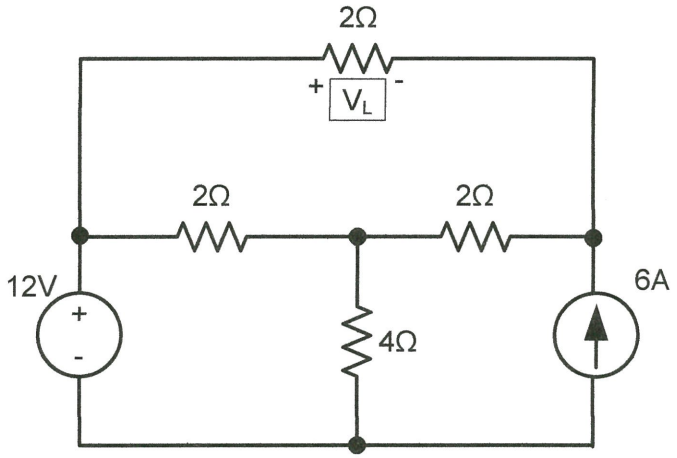


FIGURE Q23

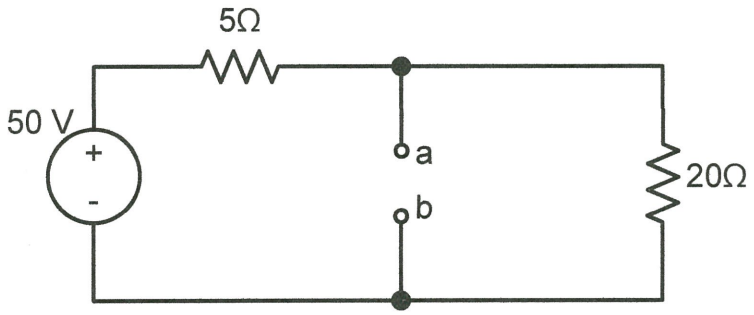


FIGURE Q24

Q24 (a) Calculate the R_{TH} across terminal a-b for circuit in Figure Q24.

(4 marks)

(b) Calculate the V_{TH} across terminal a-b for circuit in Figure Q24.

(4 marks)

(c) Calculate the value of R at terminal A-B for maximum power transfer

(2 marks)

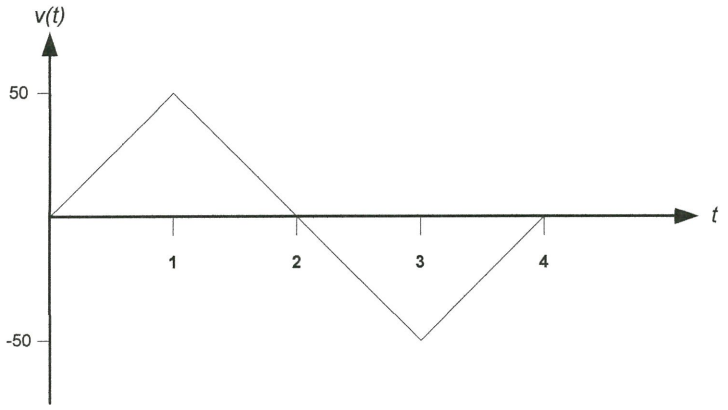


FIGURE Q25

(10 marks)

Q25 Determine the current through a 200 μF capacitor whose voltage is shown in Figure Q25. Sketch the current waveform.

Q26 (a) Sketch a basic transformer structure. Identify and labelled the core, primary winding and secondary winding.

(2 marks)

(b) Differentiate between a step-up transformer and a step-down transformer.

(2 marks)

(c) An ideal transformer is rated at 2400/120V, 9.6kVa, and has 50 turns on the secondary side. Calculate:

(i) The turn ratio

(ii) The number of turn on the primary side

(iii) The current rating for primary and secondary winding

(6 marks)

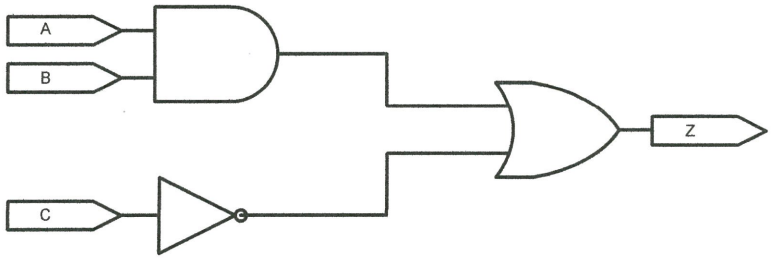


FIGURE Q27

Q27 (a) Analyze the logic circuit in Figure Q27 and obtain the Boolean expression for Z
(4 marks)

(b) Analyze the logic circuit in Figure Q27 and fill in the truth table below.
(6 marks)

A	B	C	Z

Q28 Given a sinusoid

$$v(t) = 12\cos(50t + 10^o)$$

Find the:

(a) Amplitude
(b) Phase
(c) Period
(d) Frequency

(10 marks)

LIST OF FORMULA

OHMS LAW

$$V = IR$$

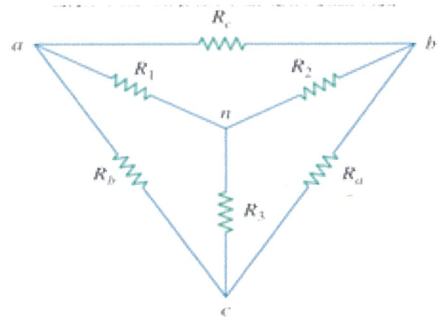
JOULE'S LAW

$$P = IV$$

KIRCHHOFF LAW

$$\sum_{k=1}^{n} i_k = 0 \qquad \sum_{v=1}^{n} v_k = 0$$

WYE-DELTA TRANSFORMATION

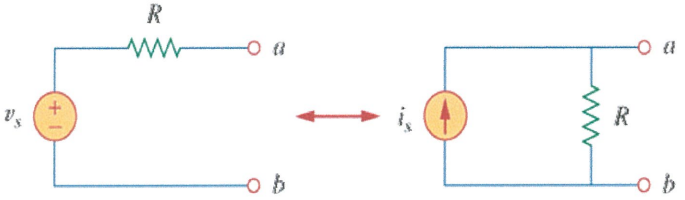


$$R_a = \frac{R_1R_2 + R_2R_3 + R_3R_1}{R_1} \qquad R_1 = \frac{R_bR_c}{R_a + R_b + R_c}$$

$$R_b = \frac{R_1R_2 + R_2R_3 + R_3R_1}{R_2} \qquad R_2 = \frac{R_cR_a}{R_a + R_b + R_c}$$

$$R_c = \frac{R_1R_2 + R_2R_3 + R_3R_1}{R_3} \qquad R_1 = \frac{R_aR_b}{R_a + R_b + R_c}$$

SOURCE TRANSFORMATION



$$V_S = I_sR$$

THEVENIN AND NORTON EQUIVALENT CIRCUIT

$$R_{TH} = R_N \qquad IN = \frac{V_{TH}}{R_{TH}}$$

$$P = i^2R_L = \left(\frac{V_{TH}}{R_{TH} + R_L}\right)^2 R_L \qquad \text{When } R_L \neq R_{TH}$$

$$P_{max} = \frac{V_{TH}^{\ 2}}{4R_{TH}} \qquad \text{When } R_L = R_{TH}$$

CAPACITOR AND INDUCTOR

$$C = \frac{\varepsilon A}{d} \qquad v(t) = \frac{1}{C}\int_{-\infty}^{t} i(t)dt + v(t_0)$$

$$i = C\frac{dv}{dt} \qquad w = \frac{1}{2}Cv^2$$

$$L = \frac{N^2 \mu A}{l} \qquad v = L\frac{di}{dt}$$

$$i = \frac{1}{L}\int_{t_0}^{t} v(t)dt + i(t_0) \qquad w = \frac{1}{2}Li^2$$

$$\tau = RC \qquad \tau = \frac{L}{R}$$

PHASOR REALTIONSHIP

$$v(t+T) = v(t)$$

$$f = \frac{1}{T}$$

$$z = x + jy = r\angle\phi = r(\cos\phi + j\sin\phi)$$

ALTERNATING CURRENT POWER CALCULATION

$$P(t) = v(t)i(t)$$ Instantaneous power

$$P = \frac{1}{2}\mathrm{Re}[VI^*] = \frac{1}{2}V_m I_m \cos(\theta_v - \theta_i)$$ Average power

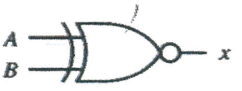
$$i_{RMS} = \sqrt{\frac{1}{T}\int_0^T i^2 dt}$$

$$P_{RMS} = {I_{RMS}}^2 R = \frac{{V_{RMS}}^2}{R}$$

TRANSFORMERS

$$\frac{V_P}{V_S} = \frac{N_P}{N_S}$$

LOGIC GATES

Name	*Graphic symbol*	*Algebraic function*	*Truth table*
AND		$x = A \cdot B$ or $x = AB$	A B | x 0 0 | 0 0 1 | 0 1 0 | 0 1 1 | 1
OR		$x = A + B$	A B | x 0 0 | 0 0 1 | 1 1 0 | 1 1 1 | 1
Inverter		$x = A'$	A | x 0 | 1 1 | 0
Buffer		$x = A$	A | x 0 | 0 1 | 1
NAND		$x = (AB)'$	A B | x 0 0 | 1 0 1 | 1 1 0 | 1 1 1 | 0
NOR		$x = (A + B)'$	A B | x 0 0 | 1 0 1 | 0 1 0 | 0 1 1 | 0
Exclusive-OR (XOR)		$x = A \oplus B$ or $x = A'B + AB'$	A B | x 0 0 | 0 0 1 | 1 1 0 | 1 1 1 | 0
Exclusive-NOR or equivalence		$x = (A \oplus B)'$ or $x = A'B' + AB$	A B | x 0 0 | 1 0 1 | 0 1 0 | 0 1 1 | 1