

M1.(a)

A	B	\bar{A}	\bar{B}	A.B	$\bar{A} . \bar{B}$	Q
0	0	1	1	0	1	1
0	1	1	0	0	0	0
1	0	0	1	0	0	0
1	1	0	0	1	0	1

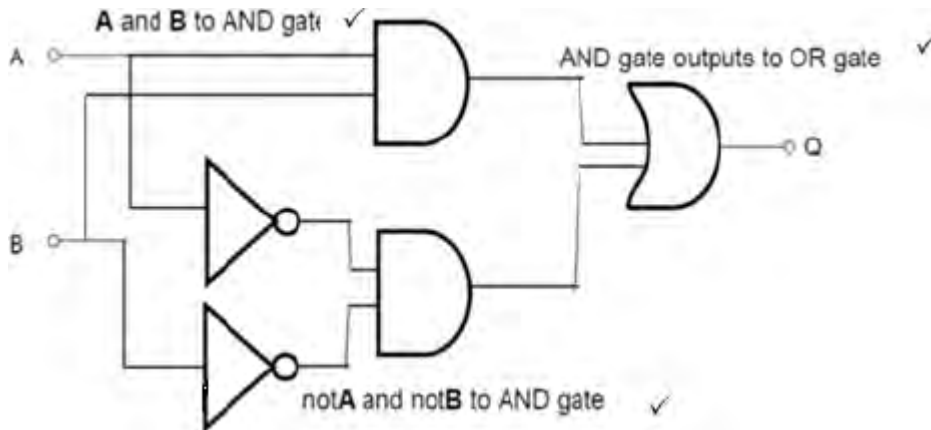
Both correct

First line Q = 1

Third line Q = 0

1

(b)



3

[4]

M2.(a)

A	B	a	b	c	d	e	f	g	Display
0	0	0	0	0	1	1	1	0	L
0	1	1	0	1	1	0	1	1	S
1	0	1	0	1	1	0	1	1	S

1	1	0	1	1	0	1	1	1	H
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1 mark for row L
 1 mark for row S (both)
 1 mark for row H

3

(b) EXOR gate

1

(c) (i) Different combinations produce different brightness
 1 Disadvantage

1

(ii) $R=V/I$; $(5V - 2.2V) / 20mA$; $2.8V / 20mA = 140\Omega$
 1 mark for 2.8V drop
 1 mark for answer

2

(iii) $E24 = 150\Omega$
 1 mark for answer

1

(8)

M3.(a) $D = C + B$

$$E = \overline{A} \quad 1$$

$$G = \overline{A+B} \quad 1$$

3

(b)

INPUTS	INTERMEDIATE OUTPUTS
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C	B	A	D	E	G
0	0	0	0	1	1
0	0	1	0	0	0
0	1	0	1	1	0
0	1	1	1	0	0
1	0	0	1	1	1
1	0	1	1	0	0
1	1	0	1	1	0
1	1	1	1	0	0

2 marks for each of correct columns D & G
1 mark for column E

5
(Total 8 marks)

M4.(a)

INPUTS			OUTPUTS		
Tunnel Sensor T	Car Sensor C	Lorry Sensor L	Message Display M	Red Stop light R	Green Go light G
0	0	0	0	0	1
0	0	1	0	0	1
0	1	0	0	0	1
0	1	1	1	1	0
1	0	0	0	1	0
1	0	1	0	1	0
1	1	0	0	1	0
1	1	1	1	1	0

Column M – 2 marks

Column G – 2 marks

4

(b) $R = T + (C.L)$

1 mark for terms

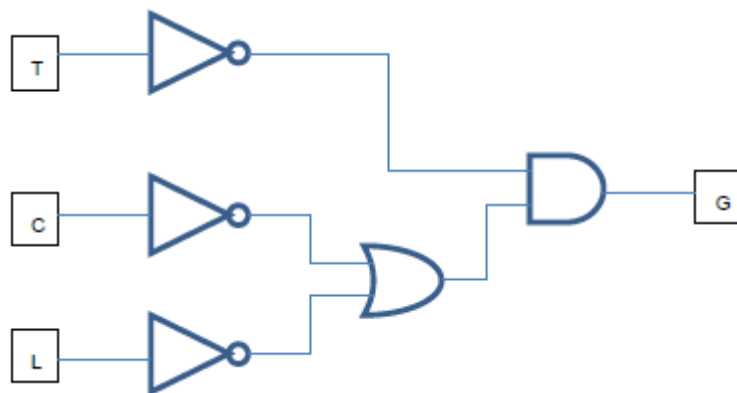
1 mark for OR

Or for full expression $S = T + (\bar{T}.C.L)$

Max 1 mark

2

(c)



3
(Total 9 marks)

M5.(a) \bar{A} ✓

$\bar{B.C}$ ✓✓

3

(b) $\overline{D+E}$ ✓✓

2

(c)

A	B	C	D	E	Q
0	0	0	1	1	0

0	0	1	1	1	0
0	1	0	1	1	0
0	1	1	1	0	0
1	0	0	0	1	0
1	0	1	0	1	0
1	1	0	0	1	0
1	1	1	0	0	1

✓ ✓ ✓ ✓

4

(d) (3-input) AND gate ✓

1

[10]

M6.(a)

A	B	C	D	Q
0	0	1	0	0
0	1	1	1	1
1	0	1	1	1
1	1	0	1	0

✓ ✓ ✓

3

(b) $C = \overline{A.B}$ ✓
 $D = A+B$ ✓
 $Q = \overline{A.B} \cdot (A+B)$ ✓

4

(c) EXOR ✓

1
[8]