BEYKOZ ÜNİVERSİTESİ	Açıklama(lar): Instructions Use the space provided GOOD LUCK!	Öğrenci İmzası Student Signature	Ön Sayfa (lar) Puanı Front Page (s) Grade	
			Arka Sayfa (lar) Puanı Back Page(s) Grade	
			Toplam Puan Total Exam Grade	

Öğrenci Adı ve Soyadı Student Name and Surname		**Sınav Tarihi** Exam Date	**27.03.2024**
Öğrenci Numarası Student Number		**Sınav Saat Aralığı** Exam Time Interval	
Programı Program	**Computer Engineering**	**Sınav Süresi (Dakika)** Exam Duration (Minutes)	**60**
Ders Kodu Course Code	**60714MEEOZ-ELE3144**	**Sınav Not Katkı Yüzdesi (%)** Exam Percentage in Overall Grade (%)	**%8**
Ders Adı/Sınav Course Name/Exam	**Digital System Laboratory/ MIDTERM**		

QUESTIONS

Q1 (30pt)-

M is a decimal number which is M=169

a) (5pt) Convert M into a **8 bit** binary number. Show your steps.
b) (10pt) Convert the binary number found in part (a) to octal. Use direct conversion.
c) (10pt) Convert the binary number found in part (a) to hexadecimal. Use direct conversion.
d) (5pt) Obtain 1's complement of the binary number found in (a).

a-) 1010 1001

b-) $(251)_8$

c-) $(A9)_{16}$

d-) 0101 0110

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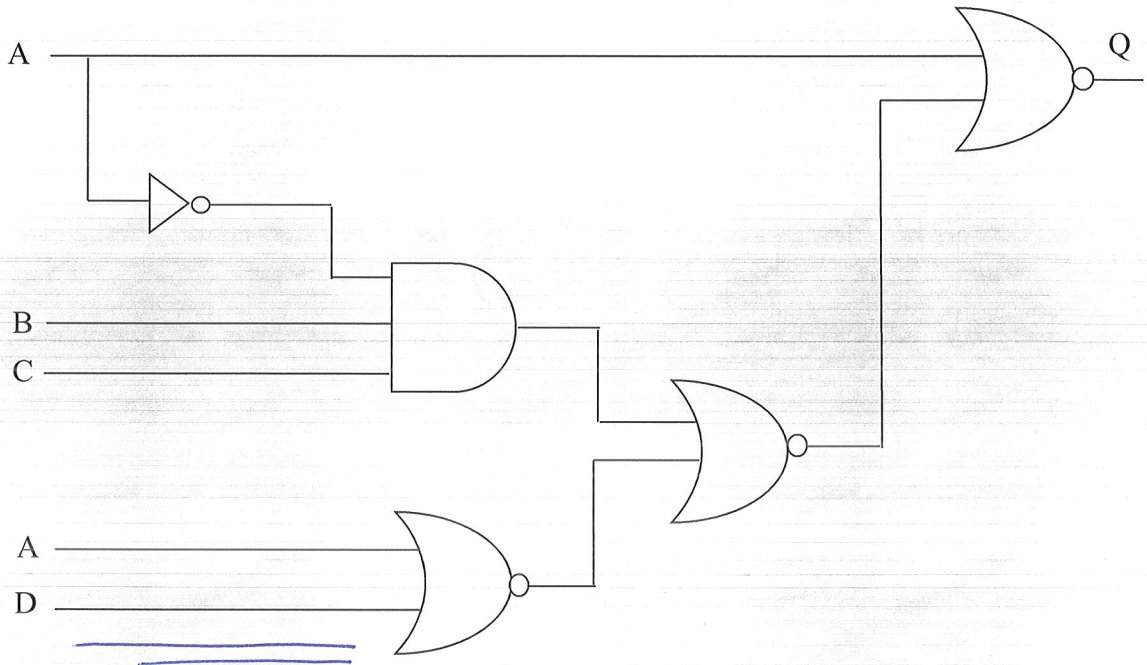
Q2 (40pt) -

a) (5pt) Derive the Boolean expression (use Boole operators only, + . ') for the output of the following logic system. **(Do not simplify at this step!)**
b) (15pt) Simplify the expression. List the general boolean algebra theorems that are used (just explain what you are doing step by step).
c) (10pt) Create the corresponding truth table.
d) (10pt) Draw the simplified circuit.



a-) $Q = A + \bar{A}BC + \overline{A+D}$

b-)
- Demorgan

$Q = \bar{A}\,(\bar{A}BC + \overline{A+D})$

- Involution Law

$Q = \bar{A}.(\bar{A}BC + \overline{A+D})$

- Demorgan Law

$Q = \bar{A}(\bar{A}BC + \bar{A}\bar{D})$

- Distribution Law

$Q = \bar{A}.\bar{A}.B.C + \bar{A}.\bar{A}.\bar{D}$

- Idempotent Law

$Q = \bar{A}BC + \bar{A}\bar{D}$

c-)

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

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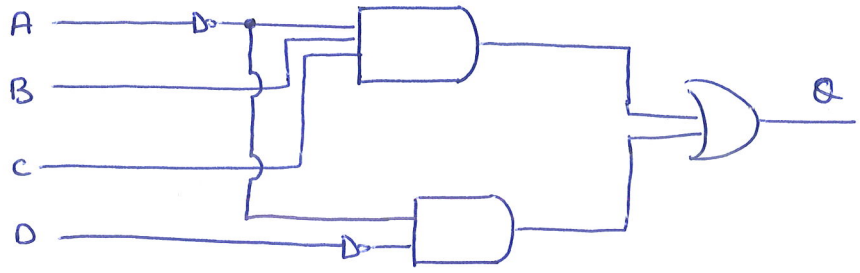
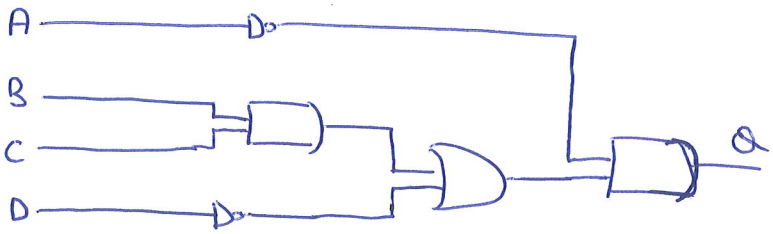
d-) For Answer = $\bar{A}BC + \bar{A}\bar{D}$



For Answer = $\bar{A}(BC + \bar{D})$

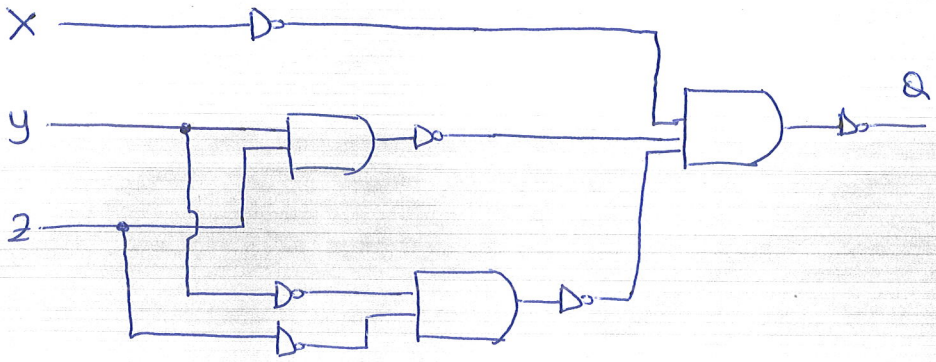


Q3 (30pt)-

$$Q = X + YZ + \bar{Y}\bar{Z}$$

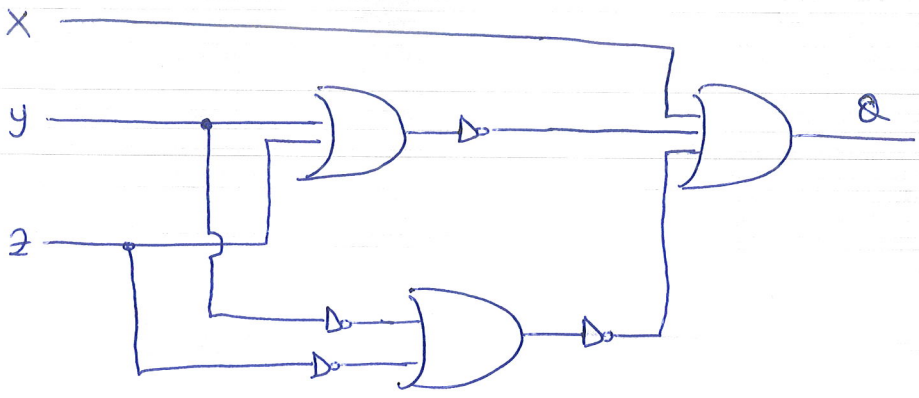
a) (15pt) Draw the circuit using only AND and NOT gates.
b) (15pt) Draw the circuit using only OR and NOT gates.

a-) $\bar{\bar{Q}} = Q = \overline{X + yz + \bar{y}\bar{z}} = \bar{X} \cdot \overline{yz} \cdot \overline{\bar{y}\bar{z}}$



b-) $\overline{\overline{yz}} = yz \qquad \bar{y}\bar{z} = \overline{\overline{\bar{y}\bar{z}}}$

$Q = X + \overline{\overline{yz}} + \overline{\overline{\bar{y}\bar{z}}} = X + \overline{\bar{y} + \bar{z}} + \overline{\bar{\bar{y}} + \bar{\bar{z}}} = X + \overline{\bar{y} + \bar{z}} + \overline{y + z}$



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