EASTERN MEDITERRANEAN UNIVERSITY
Computer Engineering Department
CMPE223/CMSE222, Midterm I

Number: …… **Name:** …… **Duration:** 90 Min.

Q1: [40pts] Answer the following:

a) What is the decimal equivalent of the following signed binary number: 1111 0110

……

---

b) Using the 2's-complement representation, what is the result of the following signed arithmetic operation [use 7 bits representations]: (- 27)-(13)

……..

……..

……....

…… Result=(……)$_2$, OverFlow: Yes/No

---

c) Using Boolean algebraic manipulations, simplify F(A,B,C)=A'+AB+AC'+ABC'

F=……..

---

d) Given F(A,B,C,D)=(A+B).C'+D', find

F_{dual}= …… Using F_{dual} , find F'=……

---

e) Given F(A,B,C,D)=(A'+B'+D')(A+B'+C')(A'+B+D')(B+C'+D'), Find F in canonical POS form

F(A,B,C,D)= $\prod$M(……..)

---

f) Given F(A,B,C)=A+BC.(A'+$B'C'$), Find F in canonical SOP form

F(A,B,C)= $\sum$m(……..)

Q2: [10pts] Given $\mathbf{F'(A,B,C,D)=\sum m(0,4,5,6,7,8,10)}$, find the minimal F_{sop}(A,B,C,D)?

F_{sop}(A,B,C,D)=……..

Q3: [15pts] Implement **F(A,B,C,D)=$\prod$M(0,8,9,10,11)** by using minimum number of NAND gates only (First simplify F in SOP form). Complements are available.

F_{sop}(A,B,C,D)=……..

Q4: [15pts] Implement **F(A,B,C,D)=$\sum$m(0,2,4,6,9,15)+d(3,7,11,13)** by using minimum number of NOR gates only (First simplify F in POS form). Complements are available.

F_{pos}(A,B,C,D)=……
……..

Q5)[20pts] It is required to design a circuit that has four inputs **A,B,C,D** and one output **F** such that:

- The output will be binary **1** if the decimal equivalent of the input is **even and less than or equal 6**, and
- The output will be binary **0** if the decimal equivalent of the input is **odd and greater than or equal 10**.

a) Find the minimal F in SOP form F_{sop}=.....

b) Implement the circuit using NOR gates only. Complements are not available.

A	B	C	D	F