ECE: 5300 Switching Theory
Exam II
Due: Thursday 11/8/2018

Name: _____
Note: Show all your work

1. In the state and output tables for a sequential machine M given below some of the next state and output entries are left unspecified (-). Specify the next states and outputs such that M has an input consistent partition π that is closed and an output consistent partition τ such that $\pi.\tau = \pi(0)$. If such partitions cannot be found give reasons.
If the partitions defined above are found, give (i) the state assignment for M based on π and τ, (ii) state transition table for M and (iii) minimum cost sum of products expressions for next state variables and output.

PS	X=0	X=1	X=0	X=1
A	D	-	0	0
B	-	H	0	-
C	G	D	1	-
D	-	C	-	-
E	B	F	0	1
F	H	-	-	1
G	C	A	-	-
H	-	B	1	-

NS Z

2. For the incompletely specified sequential machine given below:
(i) find pairs of compatible states
(ii) find sets of maximal compatible states
(iii) give the state table, in standard form, of a reduced machine with minimum number of states.

PS	X=00	X=01	X=11	X=10
A	B,0	--	E,1	--
B	A,0	C,-	--	--
C	C,-	A,1	E,-	D,1
D	--	B,-	A,-	--
E	C,-	B,1	-,0	F,-
F	F,1	A,-	B,-	E,-

NS, Z

3. For the machine M given below (i) find a state assignment using fan-out based method, (ii) find a state assignment based on fan-in based method, and (iii) give minimum cost sum of product expressions for the next state variables and output using the state assignments found.

PS	X=0	X=1
A	A,01	B,11
B	C,11	D,10
C	E,00	F,11
D	B,01	C,10
E	G,11	A,10
F	F,10	G,00
G	B,01	G,11

NS, PQ

4. Give the state table of a synchronous sequential machine M with one input X and one output Z which scans five consecutive inputs applied to it and outputs a 1 if the number of 1s in the five consecutive inputs is greater than or equal to 2 and starts scanning the next five inputs. The number of states in M should be no more than 12.

5. Determine if the function f(a,b,c,d) = Σ(1,3,5,6,7,13,15) can be realized by a single threshold gate. If yes, give the weight threshold vector of the gate and if no give reasons.