ESC201T : Introduction to Electronics

END-Sem Exam –part C (19/12/2020) (Note there are 4-pages)
Time : 10.55AM-12.05PM. Stop at 11.50am and submit within time

QC-7 Obtain a minimized PoS expression for the given following Boolean function using K-map and then implement it using only 2-input NOR gates. Show relevant steps and the final circuit diagram. Assume that complements of input variables are already available ----2+1 Marks

$$f = \bar{a}.b.c + +\bar{a}.c.\bar{d} + \bar{c}.d + \bar{a}.\bar{b}.c$$

QC-8 Implement the combinational circuit described by the truth table shown below using a single 4:1 MUX and only 2-input OR and 2 input AND gates if required. Assume that complements of input variables are already available Show all relevant design steps and final circuit diagram ----2 Marks

A	B	C	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

QC-9 A flip-flop with two inputs A and B has four operations described below. Q(t) and Q(t+1) represent present and next state respectively. Show how this FF can be implemented using a JK FF and 2-input OR and AND gates if required. Assume that complements of A and B are also available. Show all relevant design steps and final diagram ----4 marks

A B	Q(t+1)	State
0 0	Q(t)	Hold
0 1	0	Reset
1 0	$\overline{Q(t)}$	Toggle
1 1	1	Set

QC-10 Design a synchronous counter that goes through the following repeating sequence shown below using D FFs. Use as few FFs as possible and also minimize number of gates used. Use only 2-input OR and 2-input AND gates. Show all relevant design steps including state transition table and k-maps etc used to derive Boolean expressions. Show final diagram of the design. List number of FFs and number of 2-input gates used. There is no need to check for operation with respect to unused states. ---6 marks

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