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Paper Code : ESC 301/ESC301/PC-ROB301 Analog and Digital Electronics

UPID : 003442

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

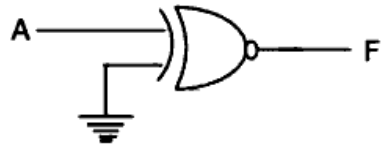
1. Answer *any ten* of the following : [1 x 10 = 10]

(I) What will be the minimal product-of-sums function described by the K-map given in Fig.

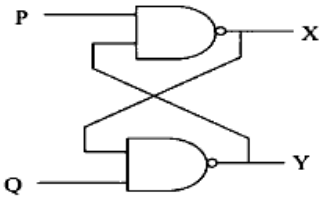
C \ AB	00	01	11	10
0	1	1	ϕ	0
1	0	0	ϕ	0

(II) Arrange the Classes of power amplifier according to their efficiency (low to high)
Class A , Class B , Class C , Class AB

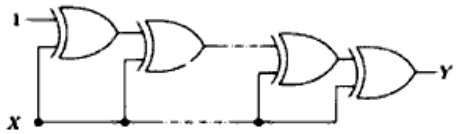
(III) What wil be the output of the logic gate in figure given below :



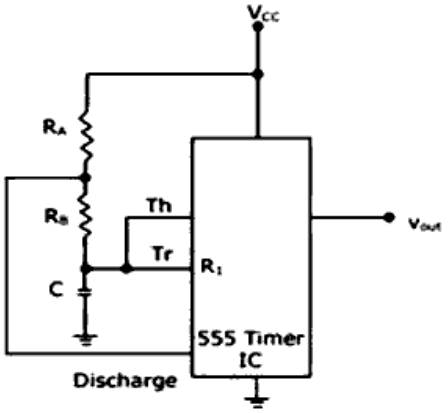
(IV) In the latch circuit shown, the NAND gates have non-zero, but unequal propagation delays. The present input condition is: P = Q = "0". If the input condition is changed simultaneously to P = Q = "1", what will be the outputs X and Y now ?



(V) If the input to the digital circuit (in the figure) consisting of a cascade of 20 XOR-gates is X. What will be the output Y ?

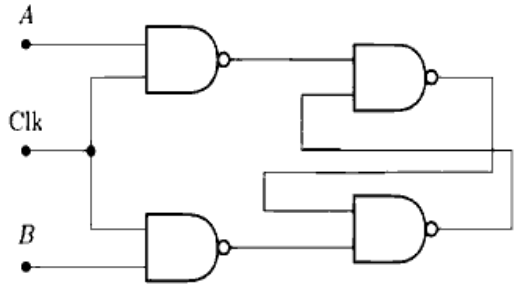


(VI) The circuit of following figure shows a IC 555 Timer connected as an Astable multivibrator. The value of the capacitor C is 10 nF. Find the values of the resistors R_A and R_B for a frequency of 10 kHz and a duty cycle of 0.75 for the output voltage.



(VII) What will be the minimum number of 2 to 1 multiplexers required to realize a 4 to 1 mutliplexer ?

(VIII) Consider the given circuit. Explain whether , the race around will occur or not



(IX) Which A/D converter is used for Hum rejection ?

(X) The a.c. output power of a Class B push-pull power amplifier is 10 watt. What will be the d.c. input power drawn from power supply when the efficiency of the is maximum .

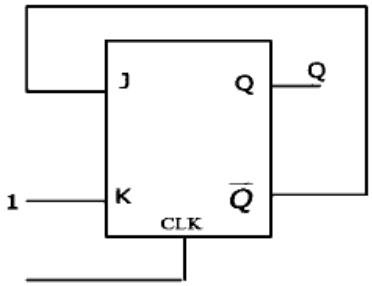
(XI) What is octal value of $(2^6)_{10}$?

(XII) Statement 1: Astable Multivibrator can be used for generating Square Wave.
Statement 2: Bistable Multivibrator can be used for storing binary information.
Please state whether both the statements are true or false.

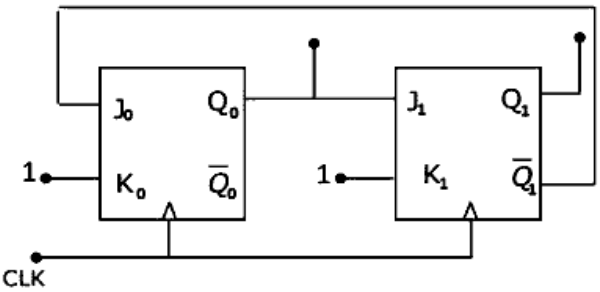
Group-B (Short Answer Type Question)

Answer *any three* of the following : [5 x 3 = 15]

2. In a JK flip-flop, we have J=Q' and K=1 (see figure). Assuming the flip-flop was intially cleared and then clocked for 6pulses, What will be the sequence at the Q output ? [5]



3. Derive the maximum efficiency of a class B amplifier [5]
4. Explain the operation of transformer coupled Cass A amplifier [5]
5. Find out what will be the modylous of this conter? [5]



6. Design a Full subtractor (X,Y and Borrow) with 4 : 1 MUX [5]

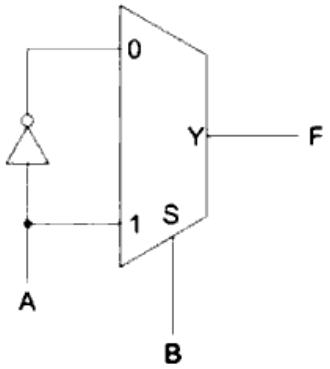
Group-C (Long Answer Type Question)

Answer *any three* of the following : [15 x 3 = 45]

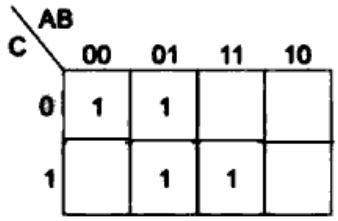
7. (a) Find the out expression for the Karnaugh Map shown below [5]

AB \ CD	00	01	11	10
00	0	0	0	0
01	1	0	0	1
11	1	0	1	1
10	0	0	0	0

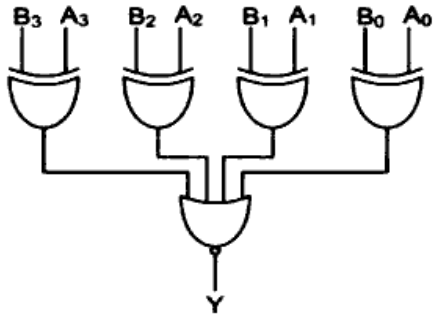
(b) Find the out F interms of A and B [3]



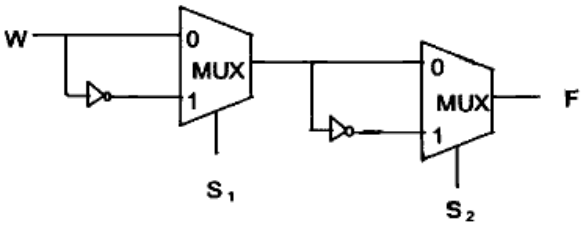
(c) Find the output expression F for the following Karnaugh Map and realise it with logic gates [7]



8. (a) A digital circuit which compares two numbers $A_3A_2A_1A_0$ (A) $B_3B_2B_1B_0$ (B) is shown in figure. Find the pair A , B to get output Y = 0 [5]

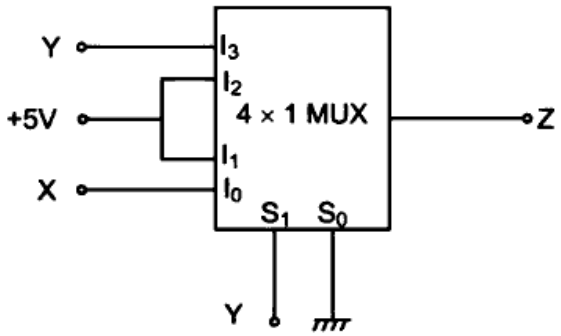


(b) Consider the multiplexer based logic circuit shown in the figure. Find the Boolean functions is realized by the circuit. [5]

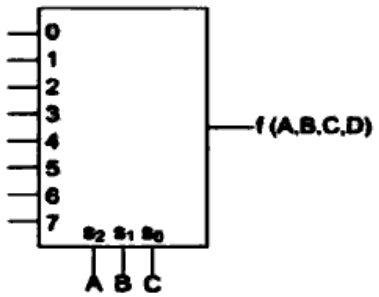


(c) A 4 bit modulo-16 ripple counter uses JK flip-flops. If the propagation delay of each FF is 50ns. Find the maximum clock frequency that can be used in this counter: [5]

9. (a) Find the output Z in terms of X and Y [8]

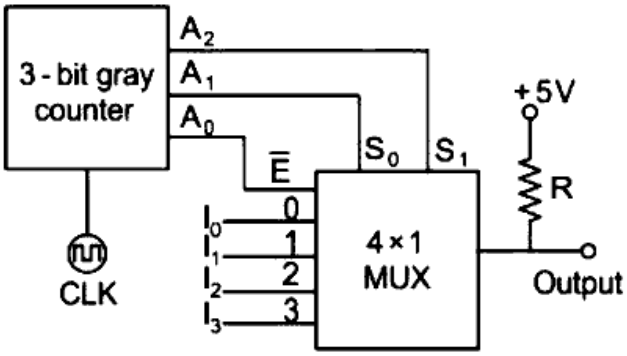


(b) A Boolean function F(A,B,C,D) = π(1, 5,12,15) is to be implemented using an 8×1 multiplexer (A is MSB). The inputs ABC are connected to the select inputs $S_2S_1S_0$ of the multiplexer respectively. [7]



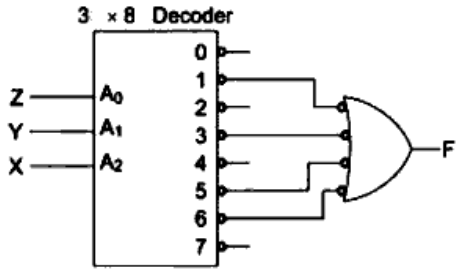
Find the correct inputs to pins 0, 1, 2, 3, 4, 5, 6, 7 in order.

10. (a) A 3-bit gray counter is used to control the output of the multiplexer as shown in the figure (A_2 is MSB and A_0 is LSB). The initial state of the counter is 000_2. The output is pulled high. Find the sequence of the output of the circuit [8]



(b) A 3 line to 8 line decoder, with active low outputs, is used to implement a 3-variable Boolean function as shown in figure: [7]

Find the simplified form of Boolean function F(A,B,C) implemented in 'Product of Sum' form.



11. (a) Digital input signals A, B, C with A as the MSB and C as the LSB are used to realize the Boolean function F = m0 + m2 + m3 + m5 + m7, where mi denotes the ith minterm. In addition, F has a don't care for m1. [10]

Find the simplified expression for F

(b) Find the prime implicants In the sum of products function (X,Y,Z)=∑(2,3,4,5) [5]

*** END OF PAPER ***