

**B TECH**  
**(SEM-VI) THEORY EXAMINATION 2017-18**  
**INTEGRATED CIRCUITS**

Time: 3 Hours

Max. Marks: 100

**Note:** Be precise in your answer. In case of numerical problem assume suitable data wherever not provided.

**SECTION A**

**1. Attempt all parts of the following questions:  $2 \times 10 = 20$**

- (a) Why CMOS NAND is preferred over CMOS NOR?
- (b) What is Capture range in PLL?
- (c) What do you understand by hysteresis voltage?
- (d) Define current mirror circuit and current steering process.
- (e) The basic step of an 8-bit DAC is 40mV. If 00000000 represents 0V, what is represented by the input 11010111?
- (f) Draw and explain the generalized impedance converter circuit.
- (g) What is the role of coupling capacitor ( $C_c$ ) in IC 741 internal circuit?
- (h) List the advantages of Wildar current source.
- (i) Sketch properly labeled Master Slave D flip flop Circuit.
- (j) Design a multiple feedback Narrow Band Pass filter with  $f_c=1$  KHz,  $Q=3$  and  $A=10$ .

**SECTION B**

**2. Attempt any three parts of the following questions:  $3 \times 10 = 30$**

- (a) Derive the expression of voltage gain in KHN Biquad Filter. Draw the KHN Biquad filter and drive transfer function of the BPF and LPF from that.
- (b) Draw and explain the block diagram of IC 555.  
 Design a 555 timer as astable multivibrator giving its block diagram which provides an output signal frequency of 2 KHz and 75 % duty cycle.
- (c) Design a wideband pass filter with lower cutoff frequency  $f_L=200$  Hz, higher cutoff frequency  $f_H=1$  kHz and a passband gain=4?

**(d)** Find the truth table and CMOS realization of the following gates:

(i) AND-OR-INVERT (AOI),  $F = \overline{AB + CD}$

(ii) OR-AND-INVERT (OAI)  $F = \overline{(A + B)(C + D)}$

**(e)** Explain the working of PLL with suitable block diagram. Write down the different applications of PLL.

### SECTION C

**3. Attempt any one part of the following: (10 X 1 = 10)**

**(a)** Define the slew rate. Also derive the relationship between  $f_t$  and slew rate for IC 741.

**(b)** What is a DAC? Explain the weighted resistor DAC with suitable diagram.

**4. Attempt any one part of the following: (10 X 1 = 10)**

**(a)** What is log amplifier and what are its applications? Draw and explain its operation.

**(b)** A combinational circuit has 3 inputs A, B, C and output F is true for following input combinations:

A is False, B is True

A is False, C is True

A, B, C are False

A, B, C are True

Write truth table and draw CMOS logic circuit for expression obtained for F using NAND gates only. (Use convention False=0 and True=1)

**5. Attempt any one part of the following: (10 X 1 = 10)**

**(a)** Draw the circuit of full wave precision rectifier and find expression for output voltage for positive half cycle of input sinusoidal waveform.

**(b)** Draw and explain a GILBERT analog multiplier.

**6. Attempt any one part of the following: (10 X 1 = 10)**

**(a)** Give CMOS implementation of a clocked SR flip-flop and explain its working.

**(b)** Draw the circuit diagram for monostable multivibrator with operational amplifier. Explain its operation. Derive the expression for its time period.

7. Attempt any one part of the following:

(10 X 1 = 10)

(a) Draw the output of the following circuit and explain its working.

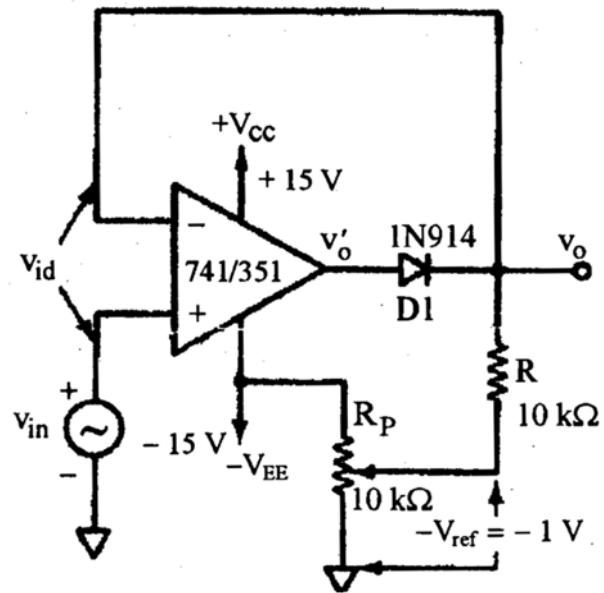


Figure 1

(b) Design and implement an inverting Schmitt trigger for use as a zero crossing detector with saturation voltages of  $\pm 15V$ , having hysteresis transition of  $\pm 25\text{mV}$ .