BTECH
(SEM V) THEORY EXAMINATION 2019-20
INTEGRATED CIRCUIT

Time: 3 Hours   *Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   **2 x 10 = 20**

   a.   Why CMOS NAND is preferred over CMOS NOR?
   b.   Draw and explain the generalized impedance converter circuit.
   c.   Implement F= (AB+A'B')' using AND-OR-INVERT logic.
   d.   What is a Super Diode.
   e.   Define and give the significance of Slew Rate.
   f.   Differentiate between Comparator and Schmitt trigger.
   g.   Give two application of analog multiplier.
   h.   Describe the need of voltage limiter circuits.
   i.   Design a multiple feedback Narrow Band Pass filter with f_c= 1kHz, Q=3 and A=10.
        μ
   j.   What are the advantages of widlar current source over constant current source.

SECTION B

2.   **Attempt any *three* of the following:**   **10x3=30**

   a.   Draw and explain the functional block diagram of IC 555. What is the operation of this IC? Design astable multivibrator with an output signal frequency of 500 Hz and 50% duty cycle.
   b.   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.
   c.   What is phase detector? What is the main function of phase detector? Briefly describe the various types of phase detectors with circuit diagram and input – output waveform.
   d.   What do you mean by the quadrant operation of multiplier? Draw and explain a GILBERT analog multiplier
   e.   Discuss hysteresis voltage with the help of neat diagram and explain the circuit of Schmitt trigger along with its transfer characteristic and applications.

SECTION C

3.   **Attempt any *one* part of the following:**   **10x1=10**

   a.   Give CMOS implementation of a SR flip-flop and explain its working.
   b.   How can you generate the triangular and square waveform from astable multivibrator. Derive an expression for the time period for both types of waves

4. 　　　**Attempt any *one* part of the following:** 　　　　　　　**10x1=10**

a. 　Draw the block diagram of a PLL and explain the function of each block. What are the advantages, disadvantages and applications of PLL. Explain any one application of PLL along with its circuit diagram.

b. 　i)Derive the output expression for RC Phase Shift Oscillator.
　　ii) Compare and contrast active filters and passive filters. Design a second order low pass Butterworth filter to have cut-off frequency of 1KHz.

5. 　　　**Attempt any *one* part of the following:** 　　　　　　　**10x1=10**

a. 　Explain how a Schmitt Trigger circuit works with a neat diagram. Design an Schmitt trigger with VUT = 2V , VLT = -1V. Assume + Vsat = + 13V

b. 　With the help of neat diagram explain the basic circuits of voltage to current converter and current to voltage converter using op amp. Also explain the frequency response of op amp IC 741.

6. 　　　**Attempt any *one* part of the following:** 　　　　　　　**10x1=10**

a. 　Draw & explain the circuit of triangular wave generator. How square wave can be obtained using this triangle wave.

b. 　What are the differences between active and passive filters? Design a wide BPF with lower cut off frequency fL
　　= 400Hz, higher cut off frequency fH = 2000Hz and a pass band gain of 8.

7. 　　　**Attempt any *one* part of the following:** 　　　　　　　**10x1=10**

a. 　What are the desirable characteristics of current mirror circuits. Explain the circuit of Wilson MOS current mirror. Also discuss how it can be improved.

b. 　Draw the circuit of a 4 bit binary weight D/A converter. Also with the help of neat diagram explain the working of dual slope integrating ADC.