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# B.Tech.
# (SEM V) ODD SEMESTER EXAMINATION2016-17
# INTEGRATED CIRCUITS

*Time: 3 Hours* *Maximum Marks: 100*

**Note:** *Attempt all questions. All questions carry equal marks*

**Q.1. Attempt any four parts of the following 5x4**

**(a)** Draw and find out Rin1, Rout1 and Gm1 of input stage of 741 Op-amp?

**(b)** Explain the advantage of improved Wilson MOS current mirror circuit and derive the expression of Rout?

**(c)** Draw and explain the advantage of widlar current mirror circuit.

**(d)** Enlist the five applications of Analog Multiplier.

**(e)** Derive the mathematical expression for equivalent impedance for inductance simulators.

**(f)** Explain the working operation of CMOS inverter with VTC characteristics.

**Q.2. Attempt any two parts of the following 10X2**

**(a)** Draw and explain basic current mirror circuit also express relation between $I_{ref}$ and $I_o$ when we consider effect of β, junction area ratio (m) and early effect?

**(b)** Give the transfer function of second order band pass filter with center frequency of $10^5$ rad/sec, a center frequency gain of 10 and 3db bandwidth of $10^3$ rad/sec.

**(c)** Draw & explain Triangular Wave Generator with necessary waveforms also find out time period of oscillation?

**Q.3. Attempt any two parts of the following 10X2**

**(a)** (i) Design a second order low pass filter of cut-off frequency 2 KHz.
(ii) Derive the all possible transfer function for state variable filter.

**(b)** The timer IC 555 is used as astable multivibrator. It is desired to have square wave output with 50% duty cycle of 2 KHz. The timing capacitor is of 0.01 f. Find the values of resistors required and draw the circuit.

**(c)** Explain block diagram of PLL. Define and derive expression for Capture range and Locked range and plot variation in input control voltage of VCO with incoming frequency?

**Q.4. Attempt any four parts of the following** **5X4**

**(a)** Explain Full wave Precision Rectifier with its transfer characteristic.

**(b)** Determine feedback voltage, period and frequency in the below figure 1

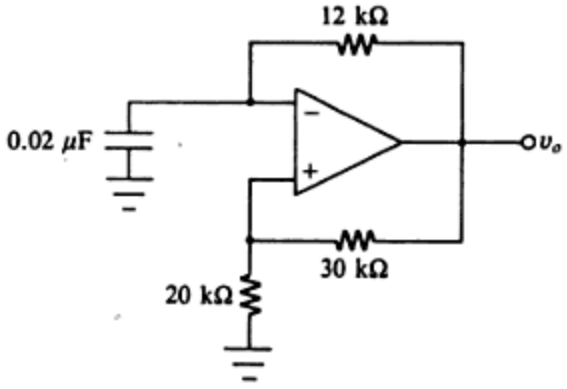


Figure 1

**(c)** Find Differential Gain of the circuit as shown in figure 2

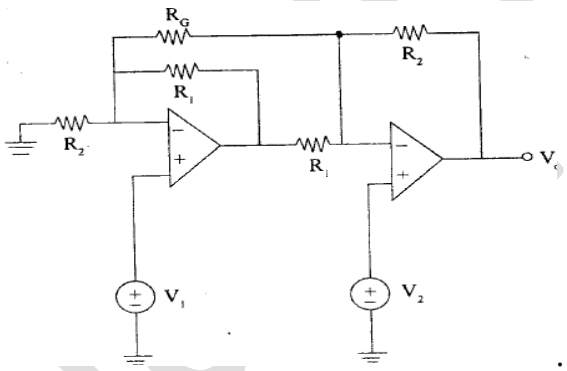


Figure 2

**(d)** Explain peak detector with input and output waveforms.

**(e)** Draw the circuit of a log-amplifier and explain its working.

**(f)** Implement Clocked SR Flip Flop using CMOS technology with NOR logic gate.

Q. **5. Attempt any four parts of the following** **5X4**

**(a)** Draw the circuits of Instrumentation Amplifier and find out overall differential gain Ad.

**(b)** Draw and explain linear phase detector using Ex-OR and find out relation between τ and phase difference.

**(c)** Explain Binary Weighted type Digital to Analog Converter.

**(d)** Draw and explain KHN Biquad Filter.

**(e)** Draw the D-Flip Flop using CMOS and explain its Master slave configuration.

**(f)** Design a two input CMOS logic circuit EX-OR gate.