

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**M. E. - SEMESTER – II • EXAMINATION – WINTER 2012**

**Subject code: 725203****Date: 01-01-2013****Subject Name: Analog and Mixed Signal IC Design****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Explain the operation of an n channel MOSFET in linear, triode and saturation regions. **06**
- (b)** Draw and explain the schematic and small signal equivalent circuit of a source follower circuit and explain its operation. What is the gain of the source follower? **08**
- Q.2 (a)** State and explain the Miller theorem. Explain one instant where the Miller theorem is used. **07**
- (b)** Draw the circuit diagram of a cascode current mirror and explain its operation. What is the advantage of a cascode current mirror? **07**
- (b)** Draw and explain the topology of voltage-voltage feed amplifier and obtain the expression for the gain of the amplifier with feedback. **07**
- Q.3 (a)** Draw and explain the circuit diagram of a single stage operational amplifier with a high gain amplifier and explain how a high gain is achieved in a single stage. **08**
- (b)** Explain what is meant by slew rate of an operational amplifier. Explain the factors that will affect the slew rate of a single stage operational amplifier. **06**
- OR**
- Q.3 (a)** Explain what is meant by output swing of an operational amplifier and explain the factors that affect the output swing of the amplifier. Compare the output swing performance of a cascode operational amplifier and a two stage operational amplifier. **08**
- (b)** Explain the need for frequency compensation in operational amplifiers and a simple technique of frequency compensation. **06**
- Q.4 (a)** Explain the basic principle behind supply independent biasing. Draw and explain a self biasing circuit for generating supply independent biasing. **09**
- (b)** Explain the operation of a proportional to absolute temperature (PTAT) voltage generator. **05**
- OR**
- Q.4 (a)** Draw the circuit diagram of a multiply by two switched capacitor circuit and explain its operation. What are the advantages and disadvantages of switched capacitor amplifiers? **07**
- (b)** Explain what is meant by ring oscillator and how it can be used as a voltage controlled oscillator. **07**
- Q.5 (a)** Explain the operation of a Flash ADC with the help of neat diagrams. What are the advantages and disadvantages of flash ADC **07**
- (b)** Draw the circuit diagram of a decoder based DAC and explain its operation. **07**
- OR**
- Q.5 (a)** Draw and explain the basic architecture of a Phase Locked Loop (PLL). What are the applications of PLLs **07**
- (b)** Explain what is meant by quantization noise in analog to digital converters. Obtain expression for the rms value of quantization noise for an ADC. **07**

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