

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
FOURTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

**Course Code: EC204**

**Course Name: ANALOG INTEGRATED CIRCUITS (AE, EC)**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) Analyse the BJT differential amplifier pair under large signal operation and illustrate its transfer characteristics. (8)
- b) How to implement the instrumentation amplifier using three Op.Amp. Deduce the condition for ensuring high CMRR in the circuit? (7)
- 2 a) Using the small signal analysis, deduce the expression for CMRR and differential input resistance of the BJT differential amplifier from fundamentals. (9)
- b) What is the principle of operation of Wilson current mirror and its advantages? Deduce the expression for its current gain. (6)
- 3 a) Deduce the expression for the closed loop voltage gain, input resistance and output resistance for an op. amp. with voltage series feed back. (10)
- b) For an op-amp having a slew rate of  $2V/\mu\text{sec}$ . What is the maximum closed loop voltage gain that can be used when the input signal varies by  $0.5V$  in  $10\mu\text{sec}$ ? (5)

**PART B**

*Answer any two full questions, each carries 15 marks.*

- 4 a) How to realize Wein-Bridge oscillator using op. amp.? Derive the condition of oscillation and frequency of oscillation for the circuit. (8)
- b) Design a circuit to generate  $1\text{KHz}$  triangular wave with  $5V$  peak. (7)
- 5 a) Illustrate the working principle of the grounded load voltage to current converter and deduce the condition for its ideal current converter. (8)
- b) Design a fullwave rectifier to rectify an ac signal of  $0.2V$  peak-to-peak. Explain its principle of operation. (7)
- 6 a) Derive the design equations for a second order Butterworth active low pass filter. (10)
- b) Design a Notch filter to eliminate power supply hum ( $50\text{ Hz}$ ). (5)

**P.T.O.**

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) Design a circuit to convert 1 KHz, 50% duty cyclesquare wave to 1 KHz, 30% duty cycle rectangular wave. (7)
- b) How to configure fold back current limiting protection in 723 voltage regulator IC. Explain the circuit with internal block diagram of the IC. (7)
- c) What is the principle of operation of successive approximation ADC? (6)
- 8 a) Illustrate the principle of operation of PLL with its capture range and lock range (7)
- b) How phase detector is implemented in digital PLL? (5)
- c) Design a circuit to multiply the incoming frequency by a factor of 5 using 565 PLL. (8)
- 9 a) Find out the Dynamic range, Full-scale value and Resolution of a 12 bit DAC having full-scale range 10V. (5)
- b) Explain the working principle of R-2R ladder type DAC with circuit. (6)
- c) What is the principle of operation of Dual slope ADC. Deduce the relationship between analogue input and digital output of the ADC. (9)

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