

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

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

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FOURTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 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) Derive CMRR, input resistance and output resistance of a dual input balanced output differential amplifier configuration. (8)
- b) Define the following: (3)
  - i) Input bias current    ii) Input offset current    iii) Input offset voltage
- c) Implement the equation using two op-amps (4)  
 $V_0 = -5V_1 + 2V_2 - 10V_3$
- 2 a) Derive the following characteristics of voltage shunt amplifier: (8)
  - i) Closed loop voltage gain    ii) Input resistance
  - iii) Output resistance    iv) Bandwidth
- b) What is slew rate? Derive an equation for it. (4)
- c) A differential amplifier has a common mode gain of 0.05 and difference mode gain of 1000. Calculate the output voltage for two signals  $V_1 = 1\text{mV}$  and  $V_2 = 0.9\text{mV}$  (3)
- 3 a) Explain the variation of differential gain of a differential amplifier with frequency of operation with relevant expressions. (5)
- b) Draw the circuit diagram of a differential instrumentation amplifier with a transducer bridge and show that the output voltage is proportional to the change in resistance. (7)
- c) How a constant current bias circuit can be used to improve the CMRR of a differential amplifier? (3)

**PART B**

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

- 4 a) Draw the circuit of a temperature compensated logarithmic amplifier and show that it provides temperature independent logarithmic output. (8)
- b) Explain the working of a triangular waveform generator with a neat circuit diagram. Also derive an expression for frequency of oscillation. (7)
- 5 a) Draw the circuit of a Wien Bridge oscillator using op-amp and derive an equation for frequency of oscillation. (7)
- b) With a neat circuit diagram explain the working of astable multivibrator using op-amp. Also derive an expression for time period. (8)
- 6 a) Draw the circuit of second order low pass filter and derive its transfer function. (8)
- b) Draw the circuit of a precision full-wave rectifier and explain its working. (7)

**PART C**

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

- 7 a) Explain how a monostable multivibrator can be implemented with 555 IC with relevant waveforms and functional diagram. Derive an expression for pulse width. (10)
- b) With a neat circuit diagram, explain the operation of a 3-bit flash converter. (10)
- 8 a) With a neat block diagram explain the working of PLL. Explain any two applications of PLL. (10)
- b) Explain the working of dual-slope ADC with a neat circuit diagram. (10)
- 9 a) Explain how short circuit, fold back protection and current boosting are done using IC723 voltage regulator. (10)
- b) With a neat circuit diagram explain the working of a weighted resistor D/A converter (10)

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