

**B.Tech. DEGREE EXAMINATION, NOVEMBER 2018**  
Fourth Semester

**EC1013 – LINEAR INTEGRATED CIRCUITS**

*(For the candidates admitted during the academic year 2013 – 2014 and 2014 -2015)*

**Note:**

- (i) **Part - A** should be answered in OMR sheet within first 45 minutes and OMR sheet should be handed over to hall invigilator at the end of 45<sup>th</sup> minute.
- (ii) **Part - B** and **Part - C** should be answered in answer booklet.

Time: Three Hours

Max. Marks: 100

**PART – A (20 × 1 = 20 Marks)**

Answer ALL Questions

- Which of the following electrical characteristics is not exhibited by an ideal Op-Amp?  
(A) Infinite voltage gain (B) Infinite bandwidth  
(C) Infinite output resistance (D) Infinite slew rate
- A differential amplifier has a differential gain of 20,000 and CMRR = 80 dB. The common mode gain is given by  
(A) 2 (B) 1  
(C) 1/2 (D) 0
- In a 741 Op-Amp there is 20 dB/decade roll off in gain starting at a relatively low frequency due to  
(A) Applied load (B) Internal compensation  
(C) Impedance of the source (D) Power dissipation in the chip
- A certain inverting amplifier has a closed loop gain of 25. The Op-Amp has an open loop gain of 100,000. If another Op-Amp with an open loop gain of 200,000 is substituted in the configuration, the closed loop gain  
(A) Doubles (B) Drops to 12.5  
(C) Remains at 25 (D) Increases slightly
- Voltage follower is a special case of  
(A) Inverting amplifier (B) Non-inverting amplifier  
(C) Adder (D) Subtractor
- An Op-amp clamper circuit is also referred as  
(A) DC cutter (B) DC inserter  
(C) DC lifter (D) DC leveler
- The OTA has \_\_\_\_\_ input impedance and a \_\_\_\_\_ CMRR.  
(A) High, low (B) Low, high  
(C) High, high (D) Low, low

b. Explain notch filter. Derive the expression for bandwidth and Q factor.

32. a. i. Explain working of a weighted resistor D/A converter. (8 Marks)

ii. How many bits are required to design a D/A converter, that can have a resolution of 5 mV? The ladder has +8V full scale. (4 Marks)

**(OR)**

b. Explain successive approximation A/D converter.

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8. A positive small signal half wave rectifier can
  - (A) Rectify signals with peak value only
  - (B) Rectify signals with value of few milli volts only
  - (C) Rectify signals with both peak value and down to few milli volts
  - (D) Not rectify peak value
9. For an oscillator to properly start, the gain around the feedback loop must initially be
  - (A) 1
  - (B) Less than 1
  - (C) Greater than 1
  - (D) Equal to feedback fraction,  $\beta$
10. What starts a free-running multivibrator?
  - (A) A trigger
  - (B) An input signal
  - (C) An external circuit
  - (D) Nothing
11. The phase detector in PLL is basically a
  - (A) Divider
  - (B) Adder
  - (C) Multiplier
  - (D) Subtractor
12. Which of the following applications include a phase-locked loop (PLL) circuit?
  - (A) Modems
  - (B) AM decoders
  - (C) Tracking filters
  - (D) FM decoders
13. A switched capacitor filter consists of
  - (A) Inductors, op-Amps and capacitors
  - (B) Capacitors, periodic switches and operational amplifiers
  - (C) Capacitors, operational amplifiers
  - (D) Inductors, op-amps
14. The output voltage of 7824 regulator is
  - (A) +4V
  - (B) -4V
  - (C) +24V
  - (D) -24V
15. A filter which significantly attenuates all frequency below  $f_c$  and passes above  $f_c$ 
  - (A) Low pass
  - (B) High pass
  - (C) Band pass
  - (D) Band stop
16. Which filter characteristics is used for filtering pulse waveforms?
  - (A) Butterworth
  - (B) Chebyshev
  - (C) Bessel
  - (D) Elliptic
17. The number of comparators in a 3-bit flash ADC is
  - (A) 3
  - (B) 8
  - (C) 16
  - (D) 7
18. Which is the fastest ADC technique?
  - (A) Successive approximation
  - (B) Parallel comparator
  - (C) Counting type
  - (D) Tracking type
19. A weighted resistor type DAC requires
  - (A) One value of resistor
  - (B) Two values of resistors
  - (C) Wide range of resistors
  - (D) No resistors

20. A DAC is an application of
  - (A) Non-inverting amplifier
  - (B) Adjustable bandwidth circuit
  - (C) Voltage to current converter
  - (D) Scaling adder

**PART – B (5 × 4 = 20 Marks)**

Answer ANY FIVE Questions

21. Explain the characteristics of an ideal op-amp.
22. Design an op-amp differentiator that will differentiate an input signal with  $f_{\max} = 100 \text{ Hz}$ .
23. Draw the half wave rectifier circuit and explain.
24. Draw the functional diagram of timer IC 555.
25. Explain the first order low pass filter with circuit diagram and frequency response.
26. Draw the schematic diagram of a DAC and list its applications.
27. Write in brief about fixed voltage series regulator.

**PART – C (5 × 12 = 60 Marks)**

Answer ALL Questions

28. a.i. Explain the basic differential amplifier with neat diagram.
  - ii. For a non-inverting amplifier  $R_1 = 1K\Omega$ ,  $R_f = 10K\Omega$ .
    - (1) Calculate the maximum output offset voltage due to  $V_{os}$ . Given  $I_b = 300nA$ ,  $I_{os} = 50nA$ ,  $V_{os} = 10mV$ .
    - (2) Calculate the value of  $R_{comp}$  needed to reduce the effect of  $I_b$ .
    - (3) Calculate the maximum output offset if  $R_{comp}$  is connected in the circuit.
- (OR)
- b. Discuss in detail about the AC characteristics of OP-AMP and also about frequency compensation technique.
29. a. Explain the working of instrumentation amplifier with neat diagrams.
- (OR)
- b. Draw neat circuit diagrams and explain the function of comparator and its applications.
30. a. Explain the working of PLL and FSK demodulation using PLL.
- (OR)
- b. Draw and explain the operation of a triangular wave generator and derive an expression for its frequency of oscillation.
31. a. Explain the working of a 723 general purpose regulator.

(OR)