



Name :
Roll No. :
Invigilator's Signature :

CS/B.TECH(EE(N)/EEE(N)/ICE(N)/SEM-3/EC(EE)-301/2011-12

2011

ANALOG ELECTRONIC CIRCUITS

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) A stable multivibrator may be used as
 - a) frequency to voltage converter
 - b) voltage to frequency converter
 - c) square wave generator
 - d) comparator.



ii) Negative feedback in amplifier

- a) increases bandwidth and increases gain
- b) increases bandwidth and decreases gain
- c) decreases bandwidth and decreases gain
- d) decreases bandwidth and increases gain.

iii) Which of the following is linear ?

- a) Current to voltage converter
- b) Logarithmic amplifier
- c) Comparator
- d) Square wave generator.

iv) For a given op-amp, CMRR = 10^5 and differential gain = 10^5 . What is the common mode gain of the op-amp ?

- a) 10^{10}
- b) 10^5
- c) 2×10^5
- d) 1.



v) The output pulse width for a monostable multivibrator using NE 555 where external resistance and capacitance are $20\text{ k}\Omega$ and $0.1\text{ }\mu\text{F}$ is

- a) 2.1 s
- b) 2.5 ms
- c) $2.2\text{ }\mu\text{m}$
- d) 2 ms.

vi) Which of the following rectifier circuits has the lowest ripple factor ?

- a) Half-wave rectifier without filter
- b) Full-wave rectifier without filter
- c) Full-wave rectifier with inductor as filter
- d) Full-wave rectifier with capacitor as filter.

vii) Voltage amplification can be obtained by using

- a) shunt shunt feedback
- b) series series feedback
- c) shunt series feedback
- d) series shunt feedback.



viii) The output of an integrator having square wave as input is

- a) triangular
- b) ramp
- c) spike
- d) parabolic.

ix) The all-pass filter has

- a) no pass band
- b) one stop band
- c) same gain at all frequency
- d) a first roll-off above cut-off.

x) An instrumentation amplifier

- a) is a differential amplifier
- b) has a gain less than 1
- c) has a very high output impedance
- d) has low CMRR.

xi) A precision diode may be used for

- a) half-wave and full-wave rectification
- b) peak value detector
- c) clipper and clamper
- d) all of these.



- xii) An all-pass filter is used when
- a) high roll-off rate is needed
 - b) phase shift is important
 - c) a maximally flat pass band is needed
 - d) a ripple stop band is important.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Draw the circuit of a series voltage regulator and explain its operation.
3. Define the following parameters in connection to op-amp :
 $2 \times 2 \frac{1}{2}$
 - a) CMRR
 - b) Slew rate.
4. Explain the operation of a current mirror circuit.
5. Define "thermal runaway" and "stability factor" of a transistor.
 $2 \frac{1}{2} + 2 \frac{1}{2}$
6. With a neat diagram explain the concepts of "load line" and "Q point" of a transistor.



GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Write down the h -parameter equations of a transistor amplifier and define h -parameters. $2 + 4$
- b) Model a h -parameter equivalent circuit by following above equations. Hence derive the expressions of the following :
- i) Voltage gain
- ii) Input impedance. $2 + 4 + 3$
8. a) Draw the circuit of self biasing arrangement of a pn p transistor. Explain physically how this arrangement provides a good stability against temperature variation. Also derive the expression for stability factor. $2 + 4 + 6$
- b) Draw the circuits of fixed bias and collector to base bias arrangements of transistor. $1 \frac{1}{2} + 1 \frac{1}{2}$
9. Explain the operation of the following circuits using op-amp : $7 \frac{1}{2} + 7 \frac{1}{2}$
- a) Logarithmic amplifier
- b) Schmitt trigger.
10. a) Draw the circuit diagram of an emitter follower and explain the nature of feedback in this circuit. What type of feedback topology is used here ? Derive an expression for the voltage gain of the circuit. $3 + 1 + 3$
- b) Draw the circuit diagram of a push-pull class B power amplifier and derive the expression for its power efficiency. $2 + 6$



11. a) Draw the circuit of a Wien-bridge oscillator and derive the expression for its frequency of oscillation. 8
- b) Explain the operation of a monostable multivibrator using 555 timer. 7
12. Write short notes on any *three* of the following : 3 × 5
- a) Voltage controlled oscillator
 - b) Level shifter
 - c) Precision rectifier
 - d) Switched Mode Power Supply (SMPS)
 - e) Voltage to current converter.

