

2012

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 the following : $10 \times 1 = 10$
- i) An instrumentation amplifier has a high
- a) supply voltage b) power gain
- c) CMRR d) output impedance.
- ii) A transistor is said to be in quiescent state when
- a) no signal is applied to the input
- b) no currents are following
- c) it is unbiased
- d) emitter junction and collector junction biased are equal.
- iii) If three cascaded stages of amplifier have gains 10, 20, 30 the overall gain will be
- a) 200 b) 400
- c) 1200 d) 6000.
- iv) Which of the following configuration can be used as buffer ?
- a) CE b) CB
- c) CC d) All of these.
- v) An astable multivibrator generates

- a) triangular waveform b) sinusoidal waveform
 - c) square waveform d) none of these.
- vi) For PLL
- a) capture range is greater than lock range
 - b) capture range is less than lock range
 - c) capture range is equal to lock range
 - d) no relationship between them.
- vii) The output impedance of an Op-Amp is
- a) medium
 - b) very low
 - c) very high.
- viii) CMRR for an Op-Amp should be
- a) all small as possible b) closed to unity
 - c) close to zero d) as large as possible.
- ix) In an active RC filter, the active element is
- a) the resistance R b) the capacitor C
 - c) the Op-Amp d) none of these.
- x) An ideal regulated power supply should have regulation which is
- a) maximum b) 50%
 - c) zero d) 75%.

GROUP – B

(Short Answer Type Questions)

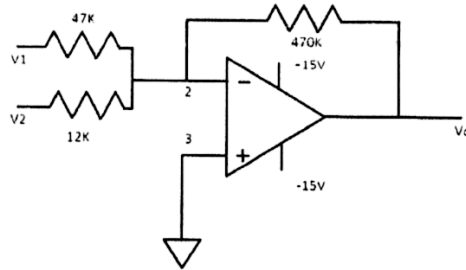
Answer any *three* of the following

$3 \times 5 = 15$

2. What is ripple ? How it can be removed from the output of a rectifier ? Explain with suitable diagram.

1 + 4

3. Calculate the output voltage of the circuit shown below, where $V_1 = 40 \text{ mV}$, $V_2 = 20 \text{ mV}$.



4. Draw and explain the Schmitt trigger circuit using Op-Amp.
5. Draw the circuit diagram of an emitter follower and state the nature of feedback in the circuit. Derive the expression of the voltage gain of the circuit from the concept of feedback.
6. What is regulated power supply ? Draw a series voltage regulator and explain its operation.

2 + 3

1 + 4

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following.

$3 \times 15 = 45$

7. a) Sketch the circuit of Wien-bridge oscillator. Explain the principle of operation and find an expression for the frequency of oscillation.
- b) Prove that the amplifier gain in a phase shift oscillator is at least 29 for sustained oscillation.
- c) A phase shift oscillator using a transistor has the following parameter values : $R_L = 3.3 \text{ k}\Omega$, $R = 5.6 \text{ k}\Omega$ and $C = 0.01 \mu\text{F}$.
8. a) What is the function of a voltage regulator ?
- b) Draw and explain the operation of a Series regulated power supply.
- c) Compare Series and Shunt regulated power supply.
- d) Calculate the ripple factor of a rectifier using capacitor filter with figure.
9. a) What is meant by Thermal runaway ? How it can be avoided ?

5 + 5 + 5

2 + 5 + 3 + 5

b) Draw and explain Self-bias circuit of an NPN transistor in CE configuration.

c) Derive an expression for the stability factor $S = \left[\frac{\partial I_c}{\partial I_{co}} \right]$ for Self-bias circuit.

(2 + 2) + 6 + 5

10. a) Explain the operation of a transformer coupled class A power amplifier.

b) What is the cross-over distortion found in a class B amplifier ? How it can be avoided ?

c) In which respect class B push-pull amplifier is better than a class A amplifier ?

6 + (4 + 1) + 4

11. Write short notes on any *three* of the following :

3 × 5

a) Schmitt Trigger

b) High frequency model of transistors

c) Hartley Oscillator

d) Four basic feedback topologies

e) SMPS

f) Current Mirror.

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