Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (ECE)/SEM-4/EC-401/2010

2010

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 : $10 \times 1 = 10$

   i) To start the oscillation, the gain of a Wien-bridge oscillator is to be

      a) > 1 b) > 2

      c) < 1 d) < 2.

   ii) The o/p imp. of a series voltage amplifier is

      a) $R_0/(1+\beta A)$ b) $R_0(1+\beta A)$

      c) $\beta R_0/(1+A)$ d) none of these.

   iii) Max. phase shift in a two-pole network is

      a) 90° b) 150°

      c) 180° d) 270°.

iv) Power amplifier handles signal which is compared to voltage amplifier,

a) small b) very small

c) large d) none of these.

v) Schmitt trigger is also known as

a) squaring circuit b) blocking oscillator

c) sweep circuit d) astable multivibrator.

vi) For a wide range of oscillations in the audio range, the preferred oscillator is

a) Hartley b) Phase shift

c) Wien-bridge d) Hartley and Colpitt.

vii) Astable multivibrator may be used as

a) frequency to voltage converter

b) voltage to frequency converter

c) squaring circuit

d) comparator circuit.

viii) An instrumentation amplifier

a) is a differential amplifier

b) has a gain less than 1

c) has very high output impedance

d) has low CMRR.

ix) The Q point in a voltage amplifier is selected in the middle of the active region because

a) it gives better stability

b) the circuit needs a small *d.c.* voltage

c) the biasing circuit then needs less number of resistors

d) it gives a distortionless output.

x) An ideal regulated power supply should have regulation which is

a) maximum b) 50%

c) zero d) 75%.

xi) To avoid false triggering of the NE 555 timer, the RESET pin (Pin 4) is generally connected to

a) Pin 8 b) Pin 1

c) Pin 3 d) No connection (NC).

xii) In a logarithmic amplifier, the logarithmic effect of the input is obtained from

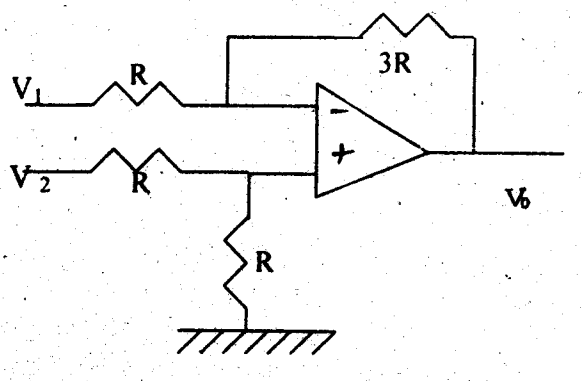
a) non-linear device, like diode or transistor

b) negative feed-back

c) the Op-Amp itself

d) the inverting input terminal.

xiii) The value of V_0 for the following circuit is given by



a) $-3V_1+2V_2$ b) $-3V_2$

c) $1{\cdot}5V_2-2{\cdot}55V_1$ d) $2V_2-3V_1$.

xiv) Differential amplifier can be used to amplify

a) only A.C. signal (input)

b) only D.C. signal (input)

c) both A.C and D.C. signals

d) none of these.

xv) Heat sinks are used in power amplifier circuits primarily to increase

a) the output power

b) the voltage gain

c) collector dissipation rating of the transistor

d) dissipation of energy of free electrons.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What do you mean by clamping circuit ? Draw its circuit diagram and discuss its operation.

3. What is Common Mode Rejection Ratio (CMRR) and Slew rate of Operational Amplifier ?

4. What is the difference between series and shunt regulators ? Draw the circuit diagram of a series regulator.

5. List the three sources of instability of collector current in a transistor. Define three stability factors.

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

6. a) Draw the circuit diagram of an emitter follower and explain the nature of feedback in this circuit. What is the feedback topology of the emitter follower ? Derive an expression for the voltage gain of the circuit from the concept of feedback. 2 + 1 + 3

   b) Show that negative feedback improves the stability of the gain of an amplifier. 4

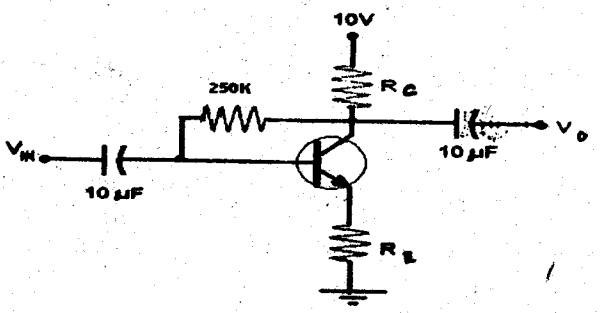
c) The open-loop gain of an amplifier is – 200. A voltage series negative feedback is used with a feedback ratio of – 0·02. The input and the output impedances of the amplifier are 2 kΩ and 40 kΩ, respectively in the absence of feedback. Determine the closed loop gain, and the input and the output impedances when the feedback circuit is completed. 5

7. a) Draw & explain a circuit which uses a diode to compensate for changes

i) in V_{BE}

ii) in I_{CO}. 6

b) Quiescent levels of the network in figure are given as : $I_{CQ} = 1 \cdot 1\,\text{mA}$ & $V_{CEQ} = 3 \cdot 7\,\text{V}$. When $V_{CC} = 10\,\text{V}, R_B = 250\,\text{k}$ & transistor parameters are $\beta = 90$ & $V_{BE} = 0 \cdot 7\,\text{V}$ and at room temperature, find R_C & R_E. 5



c) Explain the consequences of Early effect (base-width modulation). 4

8. a) Draw the circuit diagram of a voltage to current converter (grounded load) and explain its operation. 5

   b) What is Schmitt trigger ? Explain with circuit diagram. 5

   c) Explain Logarithmic amplifier with circuit diagram. 5

9. a) Draw the *a.c.* equivalent circuit of dual input balanced output differential amplifier and find out the expression of differential gain (Aid), input impedance, output impedance. 10

   b) Mention the advantages of active filters over passive filters. 5

10. Write short notes on any *three* of the following : 3 × 5 = 15

    a) Comparator

    b) Astable multivibrator

    c) Schottky diode

    d) Switch Mode Power Supply (SMPS)

    e) DC load line.