Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS / B.TECH (ECE) / SEM-4 / EC-401/ 2011

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 :

$10 \times 1 = 10$

i) The early effect in a bipolar junction transistor is caused by

a) fast turn-on

b) fast turn-off

c) large collector-base reverse bias

d) large emitter-base forward bias.

ii) MOSFET can be used as a

a) current controlled capacitor

b) voltage controlled capacitor

c) current controlled inductor

d) voltage controlled inductor.

iii) Thermal runaway is not possible in FET because as the temperature of FET increases

a) the mobility decreases

b) the transconductance increases

c) the drain current increases

d) none of these.

iv) A differential amplifier has a differential gain of 20000. CMRR = 80 dB. The common mode gain is given by

a) 2 b) 1

c) 1/2 d) 0.

v) Negative feedback in an amplifier

a) reduces gain

b) increases frequency & phase distortion

c) reduces bandwidth

d) increases noise.

vi) The zero crossing detector is one application of a/an

a) differentiator b) integrator

c) summing amplifier d) comparator.

vii) A Wien-bridge oscillator has frequency

a) $1/2\pi\sqrt{RC}$ b) $1/\sqrt{RC}$

c) $1/2\pi RC$ d) none of these.

viii) An RC phase shift oscillator will not produce any oscillation until and unless the voltage gain of its internal amplifier is

a) unity b) less than unity

c) around 3 d) more than 29.

ix) The type of power amplifier which exhibits cross-over distortion in its output is

a) class *A* b) class *B*

c) class *AB* d) class *C*.

x) Which of the following oscillators is used at audio frequencies ?

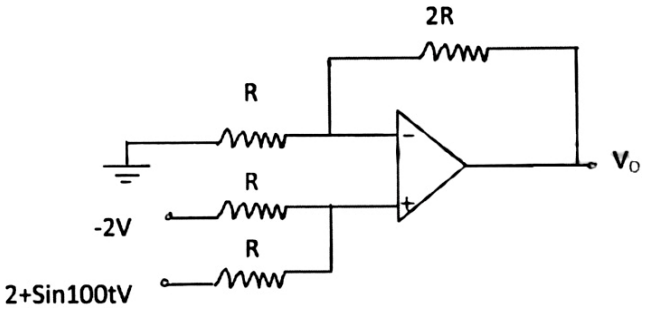
a) Crystal oscillator

b) Wien-bridge oscillator

c) RC phase shift oscillator

d) Colpitts oscillator.

xi) A non-inverting Op-Amp summer is shown in the figure given below. The output voltage V_O is



a) $3/2 \sin \omega t$ b) $3 \sin \omega t$

c) $2 \sin \omega t$ d) none of these.

xii) In series voltage regulator series pass transistor is

a) an emitter follower b) a voltage follower

c) a comparator d) none of these.

xiii) The output impedance of a shunt series feedback amplifier is

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

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

xiv) In case of monostable operation the formula for the pulse width is given by

a) $W = 1{\cdot}1\ RC$ b) $W = 0{\cdot}693\ RC$

c) $W = 1/0{\cdot}693\ RC$ d) $W = 1{\cdot}1/RC$.

xv) For ideal regulated power supply line regulation should be

a) maximum b) 50%

c) zero d) 70%.

GROUP – B

(Short Answer Type Questions)

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

2. Draw the Ebers-Moll model of the *npn* transistor & give the equation for the emitter & collector current.

3. Find out the *Q* point for a fixed bias circuit having a silicon transistor with β =100, supply voltage V_{cc} = 6V, Collector resistor R_c = 3 k ohm, and base resistor R_b = 530 k ohm. 5

4. Define and classify filters. Obtain the transfer function of a first order HPF using Op-Amp as active element. 2 + 3

5. Draw the circuit diagram of an astable multivibrator with 50% duty cycle output using 555 timer.

6. What are the limitations of an ordinary Op-Amp differentiator ? Draw the circuit of a practical differentiator that will eliminate these limitations. 2 + 3

GROUP – C

(Long Answer Type Questions)

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

7. a) What are the factors affecting stability of *Q* point ?

   b) Draw and explain voltage divider biasing circuit. Also calculate the stability factor of this biasing circuit.

   c) What is thermal runaway in the transistor amplifier circuit ? 3 + 10 + 2

8. Draw the circuit diagram of a push-pull class *B* power amplifier and explain its working. Calculate the power conversion efficiency of it and maximum collector power dissipation. 1 + 6 + 5 + 3

9. a) Draw the circuit diagram of a class *C* power amplifier and explain.

   b) Obtain the expression for efficiency of a class *B* amplifier and mention its maximum value.

   c) Explain the operation of a push-pull amplifier with suitable circuit diagram. 5 + 4 + 6

10. What is regulated power supply ? What are the factors affecting output voltage of the regulated power supply ? State the performance parameters of regulated power supply. Explain the shunt and series regulated power supply with block diagram. 1 + 3 + 3 + 4 + 4

11. a) Draw the circuit of Wien-bridge oscillator using Op-Amp and describe its working. Find an expression for the frequency of oscillation.

b) A Wien-bridge oscillator is to span a range off requencies from 30 Hz to 30 kHz. The variable capacitance can be changed from 50 pf to 500 pf. Find the resistances needed to span the frequency range. If the gain of the amplifier is 6, what must be the ratio of the resistances in the other arms of the bridge ?

(4 + 6) + 5

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

a) Clamping and Clipping circuit

b) Tuned amplifier

c) Antilog amplifier

d) Precision rectifier

e) Triangular wave generator.

==========