Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS / B.TECH (EEE / ICE / EE (O)) / 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) If input of an op-amp comparator is sine wave, output is

a) cosine wave b) spike wave

c) ramp function d) square wave.

ii) High frequency response of transistor amplifier falls due to

a) coupling capacitor at output

b) coupling capacitor at input

c) BJT's internal capacitance

d) Skin effect.

iii) BJT operated as a switch in

a) active region

b) active and saturation region

c) active and cut off region

d) cut off and saturation region.

iv) A push-pull amplifier balances out

a) odd harmonics

b) even harmonics

c) both odd as well as even harmonics

d) neither odd nor even harmonics.

v) The AC load line is the same as the DC load line when the AC collector resistance equals the

a) DC emitter resistance

b) AC emitter resistance

c) DC collector resistance

d) supply voltage divided by collector current.

vi) Transconductance indicates how effectively the input voltage controls the

a) Voltage gain b) Input resistance

c) Supply voltage d) Output current.

vii) The kind of oscillator found in an electronic wristwatch is the

a) Armstrong b) Clapp

c) Colpitts d) Quartz crystal.

viii) Differential amplifier can be used to amplify

a) only AC signal (input)

b) only DC signal (input)

c) both AC and DC signals

d) none of these.

ix) 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.

x) The input impedance is highest for

a) a CB amplifier

b) a CC amplifier

c) a CE amplifier.

xi) The maximum efficiency of a push-pull class *B* power amplifier is

a) 60% b) 78·5%

c) 33% d) 55·5%.

xii) If the input of a Schmitt trigger is a saw tooth wave, the output is

a) sine wave

b) triangular wave

c) pulse waveform

d) without any change but amplified.

xiii) To avoid false triggering of the NE 555 timer the RESET pm (Pin 4) is generally connected to

a) Pin 8 b) Pin 1

c) Pin 3 d) no connector.

xiv) In a logarithmic amplifier, the logarithmic effect of the input is obtained for

a) non-linear devices, line diode or transistor

b) negative feedback

c) the OP-Amp itself

d) the inverting input terminal.

xv) The OP pulse width for a monostable multivibrator using IC 555 where internal resistance and capacitance are 20 k Ω and 0·1 μF is

a) 2·1 s b) 2·5 ms

c) 2·2 μs d) 2 ms.

GROUP – B

(Short Answer Type Questions)

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

2. Discuss the operation of a logarithmic amplifier with the help of a suitable diagram. Can it be used to multiply two signals ? If so, how ?

3. Briefly explain the operation of a logarithmic amplifier circuit with block diagram.

4. What are the ideal characteristics of an operational amplifier ? Explain the working of a current mirror circuit with suitable current equations.

5. Define stability factor of BJT and state its significance. Find an expression for stability factor for CE amplifier with fixed bias.

6. Draw the circuit diagram for an astable multivibrator using 555 timer IC. Derive the expression the frequency.

GROUP – C

(Long Answer Type Questions)

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

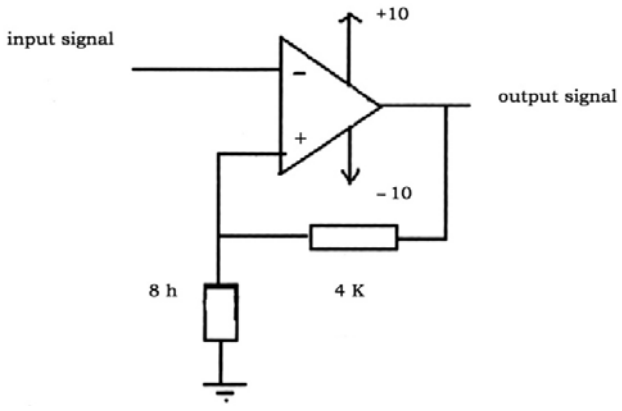
7. What is a MOS capacitor ? Explain the induction of current and conduction of current in an n-channel MOSFET with suitable characteristic curves. What are the shortcomings of small signal model in a MOSFET ?

8. Explain a class *AB* push-pull amplifier. Derive the efficiency of class *B* amplifier. Explain a self-bias circuit and give the reason for naming self-bias.

9. Sketch the circuit of Wien-bridge oscillator. Explain the principle of operation and find an expression for the frequency of oscillation.

   Prove that the amplifier gain in a phase shift oscillator is at least 29 for sustained oscillation A phase shift oscillator using a transistor has the following parameter values : $R_L = 3 \cdot 3$ kΩ, R = 5·6 kΩ and C = ·01 μF.

10. Draw the circuit of second order high passes filter & show that it blocks the low frequency and passes the high frequency. Find the upper & lower threshold voltage for circuit given below :



5 + 5 + 5

11. Write short notes on any *three* of the following : $3 \times 5 = 15$

i) Logarithmic Amplifier

ii) Pulse width modulation using IC 555

iii) Wien-bridge oscillator

iv) Four basic feedback topologies

v) Three input average adder.

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