Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH/ECE-(OLD)/EEE-(OLD)/ICE-(OLD)/SEM-4/EC-401/2013

2013

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) In a negative feedback amplifier, series mixing

a) tends to increase the input resistance

b) tends to decrease the input resistance

c) does not alter the input resistance

d) produces the same effect as the shunt mixing.

ii) In an FET transconductance is proportional to

a) I_{DS}

b) I_{DS}^2

c) $\left(I_{DS} \right)^{1/2}$

d) $1 / I_{DS}$.

iii) The input resistance of the MOSFET is of the order of

a) 100 k ohm

b) 1 mega ohm

c) 100 mega ohm

d) 10,000 mega ohm.

iv) The out voltage of a half wave rectifier using resistive load, no filter and sinusoidal input has ripple factor of

a) 1·11 b) 1·41

c) 1·21 d) 0·81.

v) With increase of load resistance, ripple voltage of rectifier with capacitor filter

a) decreases

b) increases

c) remains same

d) gets multiplied.

vi) If β is 100, the value of α is

a) 99 b) 0·99

c) 101 d) 0·01.

vii) Most of the electron that flow through the base will

a) flow into the collector

b) flow out of the base lead

c) recombine with base hole

d) recombine with collector holes.

viii) In a JFET, transconductance is of the order of

a) 1 ms b) 100 ms

c) 1 s d) 100 s.

ix) A class *B* amplifier is biased

a) at cut-off

b) impedance coupling

c) RC coupling

d) Transformer coupling.

x) Which of the following types of amplifier operation causes maximum distortion ?

a) Class *A*

b) Class *AB*

c) Class *B*

d) Class *C*.

xi) Cross over distortion takes place in

a) Tuned amplifier

b) Power amplifier

c) Small signal amplifier

d) Video amplifier.

xii) All oscillators are based on

a) Positive feedback

b) Negative feedback

c) The piezoelectric effect

d) High gain.

GROUP – B

(Short Answer Type Questions)

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

2. Explain the thermal run-away and the condition of thermal stability of a BJT.

3. What do you mean by biasing ? Draw and explain fixed bias circuit and determine its stability factor. 1 + 4

4. What is slew rate of Op-Amp ? Show that Op-Amp may use as logarithmic amplifier. 1 + 4

5. Draw the circuit diagram of a class *B* push pull power amplifier and determine the maximum conversion efficiency of the circuit.

6. Draw the circuit diagram of an instrumentation amplifier using a transducer bridge. Explain its operation.

GROUP – C

(Long Answer Type Questions)

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

7. Draw the circuit diagram of an Astable Multivibrator using 555 timer. Explain its operation. Derive the expression for the frequency of oscillation of a stable multivibrator.

4 + 6 + 5

8. a) Draw and explain the working principle of Phase Shift Oscillator. 4 + 6

a) In an RC phase shift oscillator, if the value of

R1 = R2 = R3 = 200 k ohm and

C1 = C2 = C3 = 100 pico farad, find the frequency of the oscillator. 5

9. a) Draw the circuit arrangement and explain the operation of an Schmitt trigger circuit. 7

b) Design a wide Band-pass filter with f_L = 200 Hz,

f_H = 1 kHz, and a pass band gain = 4. Also find the value of Q for the filter. 8

10. a) Draw and explain the N-channel depletion MOSFET. 8

b) Determine the pinch-off voltage for an n-channel silicon FET with a channel width of 4×10^{6} m and a donor concentration of 2×10^{21} m^{-3}. The dielectric constant of silicon is 12 and $\varepsilon_0 = 8{\cdot}854 \times 10^{-12}$ Fm^{-1}. 7

11. Write short notes on any *three* of the following : 3 × 5

a) V-I converter

b) PLL

c) Second Order Butterworth Low-Pass filter

d) Wein Bridge Oscillator

e) Transformer coupled class *A* power amplifier.