Name : ....

Roll No. : ....

Invigilator's Signature : ....

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 any *ten* of the following :

$10 \times 1 = 10$

i)   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).

ii)   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.

4003(O)   [Turn over

iii) A class *B* power amplifier has an *ac* output of 10 watts. The power drawn from the power supply under ideal condition is

    a)   10 watts   b)   12·75 watts

    c)   15 watts   d)   20 watts.

iv) The β of the Power amplifier 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) The effect of introducing RE in the CE amplifier is to

    a)   increase the voltage gain

    b)   decrease the voltage gain

    c)   increase the current gain

    d)   decrease the current gain.

vii) Astable multivibrator may be used as

    a)   frequency to voltage converter

    b)   voltage to frequency converter

    c)   squaring circuit

    d)   comparator circuit.
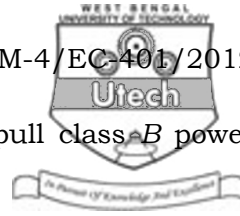
viii) The maximum efficiency of a push-pull class-*B* power amplifier is

a) 50%

b) 78·5%

c) 60%

d) 25%.

ix) Transformer couple class *A* power amplifier provides very high frequency because the

a) collector voltage is stepped up

b) *dc* resistance in the collector circuit is low

c) large signal amplifier

d) none of these.

x) Thermal runaway in a transistor based in the active region is due to the

a) heating of the transistor

b) change in β which increases with temperature

c) base emitter voltage which decreases with rise in temperature

d) change in reverse collector saturation current due to rise in temperature.

xi) The net phase-shift of Wien-bridge oscillator around the loop is

a) 90°

b) 180°

c) zero

d) 360°.

xii) A Schottky diode has

    a)   a large voltage drop than that of an ordinary diode

    b)   good ohmic contact

    c)   a negligible storage time

    d)   mainly minority carrier current.

GROUP – B

(Short Answer Type Questions)

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

2. Explain the operation of Transformer coupled class *A* power amplifier.

3. What do you mean by (i) CMRR, (ii) Slew Rate, (iii) Voltage follower circuit ?

4. What are the differences among fixed bias, collector to base bias and self-bias ?

5. a) Draw the circuit diagram of emitter follower circuit. Why is it called emitter follower ?

    b) List the three sources of instability of collector current. Define three stability factors.

6. Define the hybrid parameters for basic transistor circuit in any configuration and give its hybrid model.

GROUP – C

(Long Answer Type Questions)

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

7. a) Draw the circuit diagram of a monostable multivibrator using 555 timer and derive the expression for the pulse width of the monostable multivibrator.

    b) Draw the circuit diagram of a Logarithmic amplifier with temperature compensating network and find out the expression of output voltage. From that expression explain how temperature compensating has been done.

                                                              7 + 8

8. a) What is the main disadvantage of class *A* power amplifier ? Explain with circuit diagram, the operation of class *B* push pull amplifier.

    b) Obtain the maximum efficiency of the circuit.

    c) What do you mean by crossover distortion ? Explain with necessary waveform. How do you eliminate this distortion ?   7 + 4 + 4
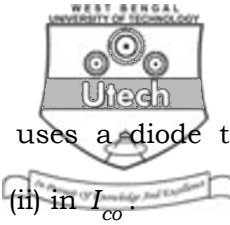
9. a) Draw and explain the circuit which uses a diode to compensate for changes (i) in V_{BE} and (ii) in I_{co}.

b) Draw and label the circuit diagram of a small signal single stage low frequency transistor amplifier in the CE mode. Using the h-parameters, obtain expression for current gain, input resistance, voltage gain, output resistance and power gain.

c) A transistor amplifier in CE configuration couples a source of internal resistance 1 kΩ to a load of 20 kΩ. Find the input and output resistance if $h_{ie} = 1$ kΩ,

$h_{re} = 2 \cdot 5 \times 10^{-4}$, $h_{fe} = 150$ and $\dfrac{1}{h_{oe}} = 40$ kΩ.   7 + 8

10. a) Draw the circuit of Wien-bridge oscillator. Explain the principle of operation and find an expression for the frequency of oscillation.

b) Prove that the gain of the amplifier in a phase shift oscillator is at least 29 for sustained oscillation.   7 + 8
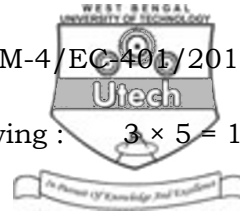
11. Write short notes on any *three* of the following : 3 × 5 = 15

    a)   VCO

    b)   PWM using 555 timer

    c)   Voltage to current converter with grounded load

    d)   Zero crossing detector

    e)   Full wave Precision rectifier.

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