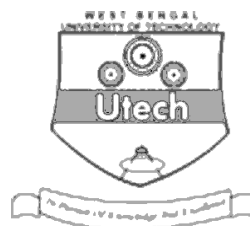


# ANALOG ELECTRONIC CIRCUITS ( SEMESTER - 4 )

CS / B.Tech(ECE-N) / SEM-4 / EC-401 / 09



1. ....  
Signature of Invigilator

2. ....  
Signature of the Officer-in-Charge

Reg. No.

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Roll No. of the  
Candidate

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CS / B.Tech(ECE-N) / SEM-4 / EC-401 / 09

ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009  
ANALOG ELECTRONIC CIRCUITS ( SEMESTER - 4 )

Time : 3 Hours ]

[ Full Marks : 70

## INSTRUCTIONS TO THE CANDIDATES :

- This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
- In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
  - For **Groups – B & C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
- Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
- Read the instructions given inside carefully before answering.
- You should not forget to write the corresponding question numbers while answering.
- Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
- Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
- You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
- Rough work, if necessary is to be done in this booklet only and cross it through.

**No additional sheets are to be used and no loose paper will be provided**

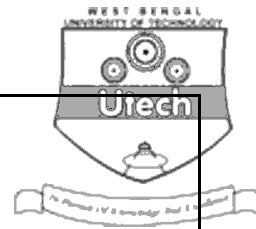
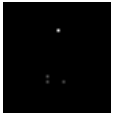
## FOR OFFICE USE / EVALUATION ONLY

Marks Obtained

Group – A								Group – B				Group – C				Total Marks	Examiner's Signature
Question Number																	
Marks Obtained																	

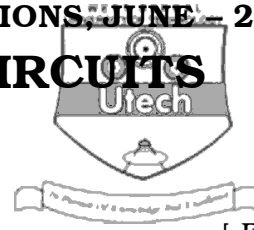
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ENGINEERING &amp; MANAGEMENT EXAMINATIONS, JUNE - 2009

**ANALOG ELECTRONIC CIRCUITS****SEMESTER - 4**

Time : 3 Hours ]

[ Full Marks : 70

**GROUP - A****( Multiple Choice Type Questions )**1. Choose the correct alternatives for any *ten* of the following :  $10 \times 1 = 10$ 

i) The  $Q$  point in a transistor 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 circuit needs less number of resistors
- d) it gives a distortion less o/p. ☐

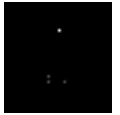
ii) A class *B* push-pull power amplifier has an *a.c.* o/p of 10 watts. The *d.c.* power drawn from the power supply under ideal condition is

- a) 10 watts
- b) 12.75 watts
- c) 15 watts
- d) 20 watts. ☐

iii) The value of  $V_0$  is

dia.

- a)  $-3V_1 + 0.5V_2$
- b)  $-3V_2$
- c)  $1.5V_2 - 2.25V_1$
- d)  $2V_2 - 3V_1$  . ☐



iv) The current  $I_{CEO}$  is

- a) the emitter current in the CC connected transistor with zero base current
- b) the collector current in the CE connected transistor with zero emitter current
- c) the collector current in the CE connected transistor with zero base current
- d) none of these. ☐



v) Emitter follower circuit is an example of

- a) positive feedback                      b) negative feedback
- c) without any feedback                  d) none of these. ☐

vi) A two stage amplifier with negative feedback has an overshoot when the damping factor  $K$  is

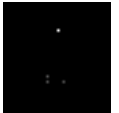
- a) less than unity                      b) greater than unity
- c) zero                                      d) negative. ☐

vii) 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. ☐

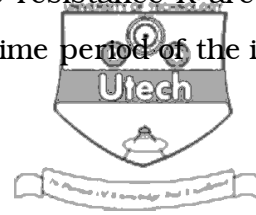
viii) A Schottky diode has

- a) a large voltage drop than that of an ordinary diode
- b) good ohmic resistance
- c) a negligible storage time
- d) mainly minority carrier current. ☐



ix) In a clamping circuit, the capacitance  $C$  and the resistance  $R$  are such that the time constant  $RC$  ..... compared to the time period of the input signal.

- a) is very large
- b) is equal to
- c) is less than.



x) The maximum efficiency of a push-pull class  $B$  power amplifier is

- a) 50%
- b) 78.5%
- c) 25%.

xi) A Hartley Oscillator is used in the

- a) RF range
- b) microwave range
- c) AF range.

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

- a) sine wave
- b) triangular wave
- c) pulse waveform
- d) without any change but amplified.

xiii) The o/p pulse width for a monostable multivibrator using IC 555 where external resistance and capacitance are  $20\text{ k}\Omega$  and  $0.1\text{ }\mu\text{F}$  is

- a)  $2.1\text{ s}$
- b)  $2.5\text{ ms}$
- c)  $2.2\text{ }\mu\text{s}$
- d)  $2\text{ ms}$ .

xiv) If the i/p to the circuit of the figure is a sine wave, the o/p will be



dia.

- a) a half-wave rectifier sine wave      b) a full-wave rectifier sine wave  
c) a triangular wave      d) a square wave.

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

- a)  $90^\circ$       b)  $180^\circ$   
c) zero      d)  $360^\circ$ .

### GROUP – B

#### ( Short Answer Type Questions )

Answer any *three* of the following.

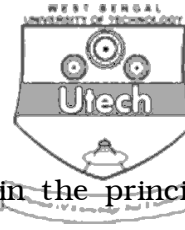
3 ∞ 5 = 15

2. Draw and explain the circuit using 555 timer IC chip to generate pulses with 50% duty cycle. Derive the expression for the frequency in terms of the external capacitor and resistors.
3. Design a wide band reject filter using first order high-pass and low-pass filters having  $f(\text{low}) = 2 \text{ kHz}$  and  $f(\text{high}) = 400 \text{ Hz}$  respectively.
4. With a neat diagram, explain the principle of operation of an anti-log amplifier.
5. Explain the operation of transformer coupled class A power amplifier.
6. Explain the thermal run-away and the condition of thermal stability of a BJT.

7  
**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.



$3 \times 15 = 45$

7. a) Sketch the circuit of Wien-bridge oscillator. Explain the principle of operation and find an expression for the frequency of oscillation.
- b) Prove that the amplifier gain in a phase shift oscillator is at least 29 for sustained oscillation.
- c) A phase shift oscillator using a transistor has the following parameter values :  
 $R_L = 3.3 \text{ k}\Omega$ ,  $R = 5.6 \text{ k}\Omega$  and  $C = 0.01 \text{ }\mu\text{F}$ .

Calculate frequency of oscillations and the  $h_{fe}$  required for sustaining the oscillations.

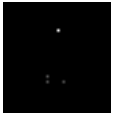
$5 + 5 + 5$

8. a) Explain the operation of IC 555 timer when used as a monostable multivibrator.
- b) Mention the advantages of active filters over passive filters.
- c) Design a second order Butter worth low-pass filter having cut-off frequency of 1 kHz.
- d) The following specifications are given for a certain wide band-pass filter :  
 $F_L = 400 \text{ Hz}$ ,  $F_H = 1 \text{ kHz}$  and passband gain = 1.

Calculate the value of figure of merit for the filter.

$3 + 2 + 5 + 5$

9. a) Define a voltage, a current and a power amplifier. What are the different classes of operation of an amplifier ?
- b) Draw the circuit of a push-pull class B transistor amplifier and explain its operation. Find an expression for the maximum efficiency of this amplifier.
- c) The mid-frequency gain of an RC coupled amplifier is 100. It is reduced to 80 at 50 Hz in the lower frequency side and 100 kHz in the higher frequency side. Find the lower and upper half-power frequencies.
- $4 + 6 + 5$



10. a) Explain the need for biasing of a transistor. Mention different schemes for biasing a transistor. Compare merits and demerits.



b) Define the stability factors.

c) Explain the self biasing arrangement of the transistor. ( 3 + 2 + 2 ) + 3 + 5

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

3 × 5

a) Wilson current source

b) Pulse width modulation using IC 555

c) Precision rectifier

d) Zero crossing detector and window detector

e) Frequency to voltage and voltage to frequency converter.

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END