



Name :

Roll No. :

Invigilator's Signature :

CS / B.TECH (EE-NEW) / SEM-4 / EC (EE)-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.*

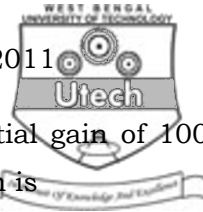
GROUP – A

(Multiple Choice Type Questions)

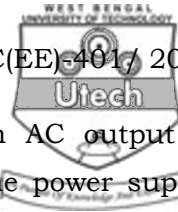
1. Choose the correct alternatives for any *ten* of the following :

$$10 \times 1 = 10$$

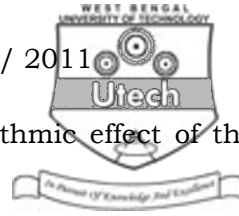
- i) Saturation region operation of a BJT implies
- a) base emitter junction forward biased, base collector junction reverse biased
 - b) base emitter junction forward biased, base collector junction forward biased
 - c) base emitter junction reverse biased, base collector junction reverse biased
 - d) none of these.



- ii) A differential amplifier has the differential gain of 100, its CMRR = 240. The common mode gain is
- a) 0.24 b) 0.417
c) 24000 d) 1.
- iii) In amplifier, if conduction is during the cycle from 0 degree to 9 degree and again from 180 degree to 270 degree, the amplifier be termed as
- a) Class A b) Class B
c) Class C d) Class AB.
- iv) Thermal runaway in a transistor biased in the region is due to
- a) heating of transistor
b) change in reverse collector saturation due to rise in temperature
c) none of these.
- v) The Q point in a voltage amplifier is selected in the middle of the active region because
- a) it gives better stability
b) the circuit needs a small DC voltage
c) the biasing circuit needs less number of resistors
d) it gives a distortion-less output.
- vi) An ideal regulated power supply should have regulation which is
- a) maximum b) 50%
c) zero d) 75%.



- vii) A class *B* push-pull amplifier has an AC output of 10 watt. The DC power drawn from the power supply under ideal condition is
- a) 10 watt b) 12.75 watt
c) 15 watt d) 20 watt.
- viii) To improve the efficiency of amplifier we have to
- a) reduce the power dissipating rating
b) reduce supply voltage
c) reduce unwanted power loss
d) none of these.
- ix) CE amplifier is used as a/an
- a) RF amplifier
b) Microwave amplifier
c) Audio frequency amplifier
d) Buffer amplifier.
- x) 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).
- xi) The maximum efficiency of transformer coupled class *A* power amplifier is
- a) 25% b) 50%
c) 79% d) 100%.
- xii) For a wide range of oscillations in the audio range, the preferred oscillator is
- a) Hartley b) Phase shift
c) Wien bridge d) Colpitt.



- xiii) In a logarithmic amplifier, the logarithmic effect of the input is obtained from
- a) non-linear device, like diode or transistor
 - b) negative feedback
 - c) the Op-Amp itself
 - d) the inverting input terminal.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. What are the differences between Series and Shunt regulators ? Draw a circuit diagram of a shunt regulator and explain its operation. $2 + 3$
3. Draw the circuit diagram of astable multivibrator using 555. Find the expression for the time period. $3 + 2$
4. Explain the operation of half-wave precision rectifier and draw its input and output waveforms.
5. Explain the operation of an Op-Amp as an adder circuit.
6. Explain the operation of a transformer coupled class A amplifier.



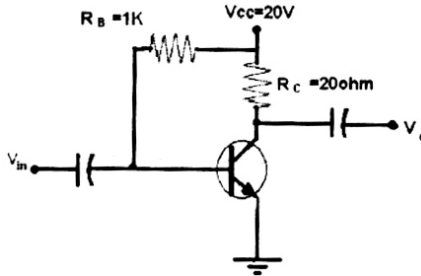
GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following.

$3 \times 15 = 45$

7. a) Find out the input power, output power and efficiency of the amplifier circuit in the figure given below for an input voltage that results in a base current of 10mA peak. Transistor parameters are $\beta = 25$, $V_{BE} = 0.75$.

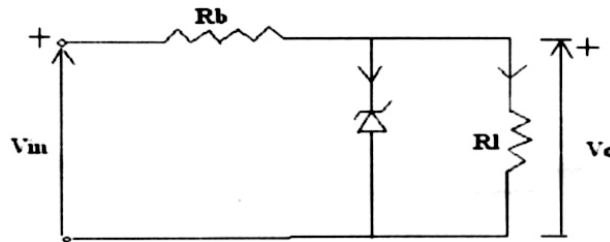


- b) Find out the maximum efficiency of a class B power amplifier.
- c) Draw and explain the operation of a complementary-symmetry push-pull circuit. $6 + 5 + 4$
8. a) What is the physical origin of the two capacitors in the high frequency hybrid- π model of a CE transistor ?
- b) For the high frequency hybrid- π model of a CE transistor, prove that
- $h_{fe} = g_m \cdot r_{b'e}$
 - $h_{ie} = r_{bb'} + r_{b'e}$
- Assuming $r_{bb'} \ll r_{b'e}$, how does h_{ie} vary with $|I_C|$?
- c) Find h_{re} in terms of common base (CB) h -parameters.

$3 + 7 + 5$



9. a) What are the different types of voltage regulators ?
- b) Explain a series transistor voltage regulator with a simple circuit. How can its performance be improved by using an Op-Amp ?
- c) In the following circuit, the Zener diode has the specification of 12V , $\frac{1}{4}\text{ W}$. $V_{in} = 20\text{V}$, $R_L = 240\ \Omega$. Calculate the value of R_b



$$3 + (4 + 3) + 5$$

10. a) What is VCO ? What are the basic differences between VCO and fixed frequency oscillator ?
- b) What are the main components of PLL ? Draw the block diagram of a PLL.

$$(2 + 3) + (5 + 5)$$



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

- a) Ebers-Moll model of a transistor
- b) Enhancement MOSFET
- c) High frequency model of transistor
- d) Logarithmic amplifier
- e) Tuned amplifier
- f) Voltage controlled oscillator
- g) Window detector
- h) Frequency to voltage converter using diode pump integrator.

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