



Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech(EE-N)/SEM-4/EC(EE)-401/2010

2010

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) The gain required for sustained oscillation in Wien-bridge oscillator is
 - a) 29
 - b) 1.5
 - c) 3
 - d) 1.
- ii) The function of a linear voltage regulator is to
 - a) minimize the change in voltage at any load condition
 - b) reduce the ripple at the output voltage
 - c) reduce the voltage fluctuation due to sudden change in load
 - d) supply constant current at all load condition.



- viii) An instrumentation amplifier
- a) is a differential amplifier
 - b) has a gain less than 1
 - c) has very high output impedance
 - d) has low CMRR.
- ix) In an amplifier, a coupling capacitor is used to
- a) match the impedance
 - b) control frequency
 - c) limit bandwidth
 - d) prevent *dc* mixing with the output.
- x) To avoid false triggering of the NE 555 timer, the RESET pin (Pin 4) is generally connected to
- a) Pin 8
 - b) Pin 3
 - c) Pin 1
 - d) no connection (NC).
- xi) The output 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 s
 - b) 2 ms
 - c) 2.5 ms
 - d) $2.2\text{ }\mu\text{s}$.
- xii) A push-pull amplifier balances out
- a) odd harmonics
 - b) even harmonics
 - c) odd as well as even harmonics
 - d) neither odd nor even harmonics.



xiii) A quiescent state of transistor implies

- a) zero bias
- b) no output
- c) no distortion
- d) no input signal.

xiv) An ideal regulated power supply should have regulation which is

- a) maximum
- b) 50%
- c) zero
- d) 75%.

xv) A MOSFET differs from JFET mainly because of

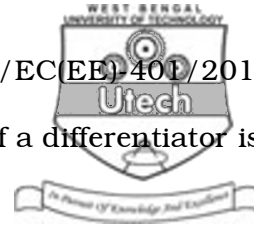
- a) power rate
- b) MOSFET has two gates
- c) JFET has a pn -junction
- d) MOSFETs do not have a physical channel.

GROUP – B

(Short Answer Type Questions)

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

2. Derive the relationship between drain to source current (I_{ds}) and drain to source voltage (V_{ds}) for MOSFET. Find the MOS transconductance (g_m) and output conductance (g_{ds}).
3. Define the stability factor and thermal run-away. Draw and explain the operation of transistor connected in CB mode.
4. Why is emitter resistance R_E in an emitter-coupled differential amplifier replaced by a constant current source? Explain why the network replacing R_E acts as a constant current I_o .



5. a) Draw the output waveforms if input of a differentiator is
- Triangular wave
 - Square wave.
- b) Obtain the expression for output voltage of an integrator using Op-Amp.
6. Write a note with related mathematical derivation of Op-Amp as an inverting and non-inverting amplifier. What is buffer ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Draw and explain the self bias circuit for a BJT. 6
- b) For the two-battery transistor circuit shown, prove that the stabilization factor S is given by

$$S = \frac{1 + \beta}{1 + \beta R_e / (R_e + R_b)} \quad 6$$

dia.

- c) Define load line and Q -point. Why is the line called 'load line' ? 2 + 1



8. a) What do you mean by the conversion efficiency of a power amplifier ? 2
- b) Draw the circuit of a Class B push-pull power amplifier and show that its maximum power efficiency is 78.5%. 8
- c) Explain with a neat diagram the working of a Class C tuned power amplifier. 5
9. a) Draw and explain the operation of a monostable multivibrator using 555 timer. 5
- b) With a neat diagram explain the operation of a square wave generator and hence prove that the frequency of oscillation depends only on external components used. 5
- c) Draw and explain the operation of a clipper circuit using Op-Amp. 5
10. a) What is a voltage regulator ? Write down the advantages of adjustable voltage regulator over fixed voltage regulators. 2 + 3
- b) With a proper circuit diagram explain the operation of a series voltage regulator. 5
- c) Explain the operation of a current mirror circuit. 5



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

- a) Current mirror
- b) SMPS
- c) PLL
- d) Wave shaper
- e) Enhancement MOSFET.

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