Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/B.Tech(OLD)/SEM-2/EC-201/2012

2012

BASIC ELECTRONICS ENGINEERING

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)   Current flows in a semiconductor depends on the phenomenon of

        a)   drift   b)   diffusion

        c)   recombination   d)   all of these.

   ii)   Doping materials are called impurities because they

        a)   decrease the number of charge carriers

        b)   change the chemical properties of semiconductors

        c)   make semiconductors less than 100 percent pure

        d)   alter the crystal structures of the pure semiconductors.

   iii) Avalanche breakdown is primarily dependant on the phenomenon of

        a)   collision   b)   doping

        c)   ionization   d)   recombination.

   iv) When a transistor is fully switched ON, it is said to be

        a)   saturated   b)   cut-off

        c)   critical   d)   complemented.

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v) The *d.c.* load line of a transistor circuit

   a) has a negative slope

   b) is a curved line

   c) gives graphic relation between I_C and I_B

   d) does not contain the *Q* point.

vi) The *h*-parameters of a transistor depend on is

   a) configuration   b) operating point

   c) temperature   d) all of these.

vii) When same input signal is applied to both the inputs of an ideal diff-amp, the output

   a) is zero

   b) depends on its CMRR

   c) depends on its voltage gain

   d) is determined by its symmetry.

viii) Negative feedback in an amplifier

   a) lowers its lower 3-dB frequency

   b) raises its upper 3-dB frequency

   c) increases its value

   d) all of these.

ix) The extremely high input impedance of a MOSFET is primarily due to the

   a) absence of its channel

   b) negative gate-source voltage

   c) depletion of current carriers

   d) extremely small leakage current of its gate capacitor.

x) A DIAC is equivalent to a

   a) pair of SCRs

   b) pair of four-layer SCRs

   c) diode and two resistors

   d) TRIAC with two gates.

xi) Since input resistance of an ideal OP-AMP is infinite
   a) its output resistance is zero
   b) its output voltage becomes independent of load resistance
   c) its input current is zero
   d) it becomes a current-controlled device.

xii) The signal to be observed on the screen of an oscilloscope is applied
   a) across its *X*-plates
   b) across its *Y*-plates
   c) to the horizontal amplifier
   d) to the trigger circuit.

xiii) Major part of the current is an intrinsic semiconductor is due to
   a) conduction-band electrons
   b) valence-band electrons
   c) holes in the valence band
   d) thermally-generated electron.

GROUP – B
(Short Answer Type Questions)
Answer any *three* of the following.　　$3 \times 5 = 15$

2. Draw the structure of an *n*-channel JFET and explain its principle of operation.

3. What are "lissajous figures" ? How can they be displayed on CRO screen ?

4. Explain zener breakdown. Draw a circuit for operating zener diode.

5. A single-phase half-wave rectifier using a 10 : 1 transformer supplies power to a 9 Ω load. If the primary input voltage has a rms value of 200 volt and forward diode resistance is 0·2 Ω and transformer secondary resistance is 0·8 Ω, determine :
   a) I_L (dc)
   b) rms ripple voltage
   c) efficiency.

6. What are the advantages and limitations of I.C. technology ?

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GROUP – C
(Long Answer Type Questions)
Answer any *three* of the following.   3 × 15 = 45

7. a) Distinguish between *n*-channel and *p*-channel MOSFETs.   5

b) What are the different types of MOSFETs ? Sketch the structure of a *p*-channel enchancement MOSFET and explain its working.   10

8. a) What are the characteristics of an ideal OP-AMP ? Draw the circuit sysmbol of a basic OP-AMP.   3 + 2

b) Draw the schematic diagram and derive the expression for the output voltage for an ideal non-inverting OP-AMP and an adder.   5 + 5

9. a) What is feedback ? Define negative feedback.   3

b) Draw the block diagram of a negative feedback amplifier and derive the expression for the votage gain with a feedback factor β.   7

c) An amplifier has voltage gain of – 500. This gain is reduced to – 100 when negative feedback is applied. Determine the feedback factor β and express the amount of feedback in dB.   5

10. a) Derive expressions for current gain and input resistance of a transistor amplifier operation in the CE mode using *h*-parameters.   8

b) A common-emitter transistor amplifier circuit has the following characteristics :

hie = 1000 Ω, h_{re} = 2·5 × 10^{-4}, h_{fe} = 50 and h_{oe} = 25 × 10^{-6} A/V. Load resistance RL = 10 KΩ and source resistance is 100 Ω. Find the current gain and input resistance.   7

11. a) Give the two-transistor representation of a SCR.   3

b) Explain the working principle of SCR.   7

c) Draw the voltage-current characteristics of a TRIAC.   5

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