Name : .....

Roll No. : .....

Invigilator's Signature : .....

2010

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) If the temperature of an *n*-type semi-conductor is increased then it becomes

a) more *n*-type b) *p*-type

c) intrinsic d) none of these.

ii) Compared to avalanche diode, Zener diode has

a) less doping concentration

b) less barrier field intensity

c) higher barrier field intensity

d) higher depletion width.

iii) Forbidden energy gap of silicon at 0 K is

a) 0·78 eV b) 1·2 eV

c) 1·5 eV d) 0·3 eV.

iv) The major part of current flowing in an intrinsic semiconductor is due to the drift of

a) conduction band electrons

b) conduction band holes

c) valence band electrons

d) valence band holes.

v) The capacitance of a varactor diode can be changed by varying its

a) doping level b) temperature

c) forward bias d) reverse bias.

vi) If a resistor has the colour code yellow-violet-gold, the value of the resistor is

a) 47 Ω b) 0·47 Ω

c) 470 Ω d) 4·7 Ω.

vii) SCR may be turned off by

a) interrupting its anode current

b) reversing polarity of anode-cathode voltage

c) both (a) & (b)

d) none of these.

viii) Voltage series negative feedback

a) increases input & output impedances

b) increases input impedance & decreases output impedance

c) decreases input & output impedances

d) increases output impedance & decreases input impedance.

ix) In reverse biased condition junction capacitance of step graded PN-junction diode varies proportionally

a) $V^{-1/2}$ b) $V^{-1/3}$

c) $V^{-1/4}$ d) none of these.

x) Without a DC source a clipper acts like a

a) rectifier b) clamper

c) chopper d) demodulator.

xi) Integrated circuit acts as a/an

a) LPF b) HPF

c) BPF d) none of these.

xii) Output impedance of an ideal op-amp is

a) 0 b) 75 ohm

c) 100 k ohm d) none of these.

xiii) The value of CMRR for an ideal op-amp is

a) 0 b) 1

c) infinite d) none of these.

xiv) The maximum efficiency of a full-wave rectifier can be

a) 37·2% b) 40·6%

c) 53·9% d) 81·2%.

xv) If the line frequency is 60 Hz, the output frequency of a bridge rectifier is

a) 30 Hz b) 60 Hz

c) 120 Hz d) 240 Hz.

GROUP – B
(Short Answer Type Questions)

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

2. Explain how Zener diode can be used as a reference voltage source.

3. Compare between an FET and a BJT.

4. Explain the working of an integrator circuit using ideal op-amp.

5. For what purpose is a triggering circuit provided in a CRO ? Explain how a CRO is used to measure the frequency of an alternating current flowing in a circuit.

6. An amplifier has a voltage gain of 200. The gain is reduced to 50 when negative feedback is applied. Determine feedback factor β and express the amount of feedback in dB.

GROUP – C
(Long Answer Type Questions)

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

7. a) What are the advantages of negative feedback ? 3

   b) Explain with proper diagram the configuration of current series and current shunt feedback circuit. 8

   c) Distinguish among Class *A*, Class *B* and Push-pull amplifiers. 4

8. a) Write the working principle of JFET with diagram. 6

   b) Define Transconductance, AC drain resistance, Amplification factor of JFET. 3

   c) Draw the common source JFET amplifier circuit and find out the expression for voltage gain, input impedance and output impedance. 4

   d) Write three differences between JFET and MOSFET. 2

9. a) Explain the Ebers-Moll Model. 5

   b) What are the factors that affect the bias stability of a transistor ? 3

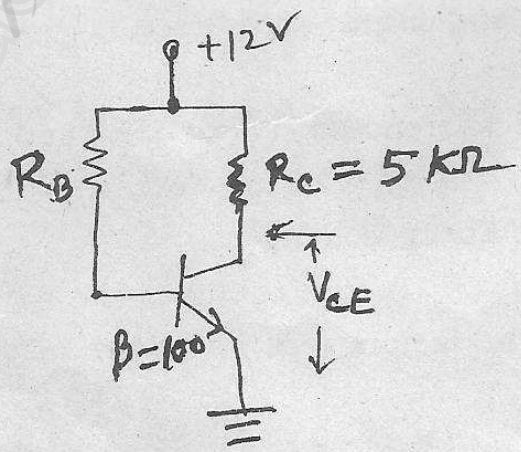
c) What is early effect ? 2

d) Draw the circuit diagram for self bias configuration considering an *n-p-n* transistor in the CE configuration. Derive the expressions for its stability factors. 3 + 2

10. a) The metal lead of the *p*-side of a *p-n* diode is soldered to the metal lead of the *p*-side of another *p-n* diode. Will the structure form an *n-p-n* transistor ? Why ? 3

b) Draw the common emitter circuit of a transistor. Sketch its output characteristics. Indicate the active. cut-off and saturation regions. 7

c) For a silicon BJT as shown in the following figure, find R_B to establish $V_{CE} = 2\,V$. Assume $V_{BE} = 0{\cdot}7\,V$. 5



11. Write short notes on any *three* of the following : 3 × 5 = 15

a) Early effect

b) Clipper circuit

c) UJT

d) Enhancement and depletion type CMOS

e) Hybrid parameters for a transistor.