

2013

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 the following : $10 \times 1 = 10$

i) The unit of mobility of charge carriers in SI unit is

- a) Ωm b) $\text{m}^2\text{V}^{-1}\text{s}^{-1}$
c) m^2Vs^{-1} d) $\text{m}^2\text{V}^{-1}\text{s}^{-2}$

ii) Emission co-efficient for Si is

- a) 1 b) 3
c) 2 d) 4.

iii) If $\beta = 200$ then α will be

- a) 0.99 b) 0.98
c) 0.95 d) 0.96.

iv) A differential amplifier has a differential gain of 20,000.

CMRR = 80 dB. The common mode gain is given by

- a) 2 b) 1
c) 0.5 d) 0.

v) When both junctions are forward biased the transistor
region operates in

- a) active region b) cut-off region
c) saturation region d) inverted region.

vi) The input offset current is equal to the

- a) difference between two base currents
b) average of two base currents

- c) collector current divided by current gain
- d) none of these.

vii) Negative feedback

- a) increases the input & output impedances
- b) increases the input impedance & bandwidth
- c) decreases the output impedance & bandwidth
- d) does not affect impedance & bandwidth.

viii) Which of the following devices has the highest input impedance ?

- a) JFET b) MOSFET
- c) Crystal diode d) BJT.

ix) The operating point is also called the

- a) Cut-off point b) Q point
- c) Saturation point d) None of these.

x) The emitter of a transistor is doped

- a) lightly b) moderately
- c) heavily d) none of these.

GROUP – B

(Short Answer Type Questions)

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

2. Describe centre tapped full wave rectifier with circuit diagram.
3. Derive the expression for conductivity of a semiconductor material.
4. What is efficiency of a rectifier circuit ? Derive the expression of efficiency of a rectifier circuit.
5. Describe common emitter transistor configuration with I/P and O/P characteristic curves.
6. What is Barkhausen criterion ? Explain voltage shunt feedback.
7. Derive the expression for voltage gain for common source

FET amplifier.

GROUP – C

(Long Answer Type Questions)

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

8. a) Describe half wave rectifier with circuit diagram. What is ripple factor ? Derive the expression of ripple factor. 10

b) Explain Zener breakdown and Avalanche breakdown. 5

9. a) What are the amplification factors for common base and common emitter transistor configuration. Derive the relationship between them. 3

b) A Ge transistor with $\beta = 49$ has a self bias arrangement.

Given $V_{CC}=10V$, $R_L=1K$, $V_{CE}=5V$, $I_C=4.9$ mA

And $V_{BE}=0.2V$. The stability factor S is desired to be

10. Obtain the values R_1 , R_2 and R_e . 6

c) Explain adder circuit using Op-Amp. What is CMRR ?

4 + 2

10. a) Explain the operation of n channel enhancement type MOSFET with transfer and drain characteristics. 8

b) Derive the expression for current gain, voltage gain of common emitter transistor configuration using h parameter model. 7

11. a) What is Barkhausen criterion ? What are the conditions of oscillation ? Explain voltage shunt feedback topology.

Derive the expression for transfer gain of a feedback amplifier circuit.

2 + 2 + 4 + 4

b) Explain offset errors of Op-Amp. 3

12. a) How is the electron beam in a CRT deflected horizontally and vertically ? Distinguish between electrostatic and magnetic deflections. 5 + 5

a) Write a brief account on the operation of SCR. 5