GURU NANAK INSTITUTE OF TECHNOLOGY

An Autonomous Institute under MAKAUT

2022

SEMICONDUCTOR DEVICES AND CIRCUITS

EE303

TIME ALLOTTED: 3Hours **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)

Answer any *ten* from the following, choosing the correct alternative of each question: **10×1=10**

		Marks	CO No
1. (i)	Voltage Regulator Normally use a) Negative Feedback b) Positive Feedback c) No Feedback d) Phase Limiting	1	CO3
(ii)	Which one of the following oscillator is used for the generation of high frequencies? a) R-C phase shift b) Blocking oscillator c) Wien bridge d) LC oscillator	1	CO3
(iii)	Which of the following is not an electronic device? a) A mobile b) A computer c) A magnifying glass d) A keyboard	1	CO1
(iv)	How many valence electrons does a pentavalent impurity have? a) 3 b) 4 c) 5 d) 6	1	CO1
(v)	The increase in the width of the depletion region in a PN junction diode is due to a) both forward bias and reverse bias b) increase in forward current c) forward bias only d) reverse bias only	1	CO1

(vi) Which of the following statement is true? Negative feedback in an amplifier — 1 — CO3
a) reduces gain
b) increase frequency and phase distortion
c) reduces bandwidth
d) increases noise

(vii) The condition of oscillator — 1 — CO3
a) $A\beta=1$
b) Feedback must be regenerated
c) Phase angle must be zero
d) All of these

(viii) What is the effect of temperature on the recombination rate of electrons in electronic circuits? — 1 — CO1
a) Recombination rate increases with increase in the temperature
b) Recombination rate decreases with increase in the temperature
c) Recombination rate is independent of temperature
d) Recombination of electrons doesn't occur in semiconductors

(ix) BJT is ___ type of source device
a) Current Driven
b) Voltage Driven
c) Load Driven
d) All of the above

(x) For a wide range of oscillations in the audio range, the preferred oscillator is — 1 — CO3
a) Hartley
b) Phase-shift
c) Colpitt
d) Wine bridge

(xi) The input based impedance of a common drain MOSFET is ____? — 1 — CO2
a) High
b) Low
c) Zero
d) Minimum

(xii) Which of the following is true about Zener diode? — 1 — CO1
a) It is lightly doped
b) It is mostly used in voltage regulator electronic circuits
c) It is used in forward bias
d) It has avalanche breakdown

GROUP – B
(Short Answer Type Questions)
(Answer any *three* of the following) **3 x 5 = 15**

		Marks	CO No
2. a.	Why the emitter is heavily doped than the base of the transistor?	5	CO1
b.	Why the width of the base region is very thin?	5	CO1
3.	Draw a Wein Bridge oscillator circuit and derive an expression for the frequency of oscillation.	5	CO3
4.	Classify the biasing of PN Junction and explain its working.	5	CO1
5.	Draw the equivalent circuit for current series feedback circuit and calculate its voltage gain, input resistance and output resistance.	5	CO3
6.	Compare n-channel MOSFET and p-channel MOSFET.	5	CO2

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

		Marks	CO No
7. a)	With a neat diagrams explain the working of a PN junction diode in forward bias and reverse bias and plot the V-I characteristics.	10	CO1
b)	Explain the effects of temperature on PN junction diode's Forward and Reverse characteristics.	5	CO1
8. a)	What are the various limitations for BJT to operate high frequencies? How these can be eliminated?	8	CO2
b)	A transistor is operating in CE configuration, in whici Vcc = 8 V, and voltage drop across resistance R connected in collector circuit is 0.5 V The value of Rc = 800 ohms.If alpha = 0.96, determine the (i) collector emitter voltage, and (ii) base current.	7	CO2
9. a)	What is the Barkhausen criterion for an oscillator? Analyse the circuit of a general oscillator.	8	CO3
b)	In a Colpitts Oscillator, the value of capacitors are C_1=0.125μF and C_2=0.020μF, the inductance of coil is L_1=0.5mH. i) Find the frequency of oscillation. ii) Determine the voltage gain of oscillator and Feedback Factor.	7	CO3
10. a)	Draw & describe the CS,CD & CB configuration of a MOSFET amplifier.	8	CO2
b)	Write a short note about input impedance & output impedance of a MOSFET amplifier.	7	CO2
11.	Write short notes on any three of the following:	3x5=15	
a)	Clipper and Clamper circuit.	5	CO3
b)	Bridge rectifier	5	CO2
c)	Hartley Oscillator	5	CO1
d)	Zener diode	5	CO2
e)	Forward & Reverse Bias P-N Junction	5	CO1