RollNo.

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APR / MAY 2025

BIOMEDICAL ENGINEERING
III Semester
BM23302 &ELECTRONIC DEVICES AND CIRCUITS
(Regulation2023)

Time:3hrs   Max.Marks: 100

CO1	Understand the structure and characteristics of basic electronic devices
CO2	Perform DC analysis and AC analysis of Circuits
CO3	Apply positive feedback principle and design oscillators.
CO4	Analyze and design amplifier circuits
CO5	Experiment and analyse the characteristics of basic electronic devices and circuits
CO6	Design simple electronics circuits using simulation tools.

BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A(10x2=20Marks)
(Answer all Questions)

Q.No.	Questions	Marks	CO	BL
1	What causes Zener breakdown and how does it occur?	2	CO1	L1
2	Difference between an indirect and direct semiconductors?	2	CO1	L2
3	Draw the circuit symbol of n-Channel Enhancement and Depletion MOSFET?	2	CO5	L2
4	In transistor DC current gain (β)= 50 and emitter injection efficiency is 0.995 and calculate base transport factor.	2	CO5	L3
5	What is small signal analysis in amplifier circuits?	2	CO4	L2
6	Sketch the circuit diagram of a BJT CB amplifier and state its characteristics	2	CO4	L2
7	What is differential mode gain in Differential Amplifier using AC analysis	2	CO2	L2
8	What is the purpose of neutralization technique in an amplifier circuits?	2	CO2	L2
9	What are the necessary conditions for oscillations in an oscillator circuit?	2	CO3	L2
10	In RC Phase Shift Oscillator, if $R_1 = R_2 = R_3 = 200k\Omega$ and $C_1 = C_2 = C_3 = 100pF$. Calculate the frequency of oscillation.	2	CO3	L3

PART- B(5x 13=65Marks)
(Restrict to a maximum of 2 subdivisions)

Q.No.	Questions	Marks	CO	BL
11 (a)	i) The forward biasing voltage of PN junction diode is 1V. Calculate the Diffusion capacitance offered at 300K. (Assume carrier lifetime of hole is 10µs and reverse saturation current = $10^{-11}A$)	6	CO1	L3
	ii) In a voltage regulator circuit Vin = 12V, Voltage across diode is 5V and load current is vary from 100mA to 500mA. Assume that the Zener diode is ideal i.e. Knee current is negligible and resistance is 0 in breakdown region. Calculate the series and load resistance.	7	CO1	L4

	OR			
11 (b)	i) An LED emits blue light at 450 nm. Calculate the bandgap energy in electron-volts.	6	CO1	L3
	ii) What are the key differences between HWR and FWR in terms of efficiency, Peak Factor, Form Factor, and Transformer Utilization Factor	7	CO1	L4
12 (a)	i) Describe the operating characteristics and current gain of CE BJT configuration.	7	CO5	L2
	ii) The reverse saturation current of transistor in Common Base is 0.1µA and for Common Emitter configuration is 16µA. Calculate the current gain for Common Base, Common Emitter and Common Collector.	6	CO5	L7
	OR			
12 (b)	i) In n-channel JFET, calculate the transconductance of transistor when VGS is connected to -4V assuming Pinch off Voltage = -10V and drain – to – source saturation current is 100mA at VGS = 0V.	6	CO5	L5
	ii) Explain the structure and working principle of a Silicon Controlled Rectifier (SCR)	7	CO5	L2
13 (a)	Derive an expression for the voltage gain (A_v), current gain (A_I), Input Impedance and Output Admittance of a CE amplifier using the h-parameter model,	13	CO4	L5
	OR			
13 (b)	Draw the circuit diagram of a source follower using a MOSFET and derive expressions for the voltage gain, input resistance and output resistance	13	CO4	L5
14 (a)	Describe the frequency response and features of a single-tuned amplifier	13	CO2	L4
	OR			
14 (b)	Derive the efficiency of Class A, Class B and Class AB power amplifier configurations using AC analysis.	13	CO2	L4
15 (a)	Evaluate the Input and Output Resistance for the Voltage Series and Current Series Feedback Amplifier using AC equivalent circuits with Open loop gain of 50, Input Resistance of 1 kΩ, Output Resistance of 2.5 kΩ and Feedback Factor of 0.05.	13	CO3	L4
	OR			
15 (b)	Explain the operation of Hartley and Colpitts oscillator using BJT to achieve the frequency of oscillation.	13	CO3	L4

PART- C(1x 15=15Marks)
(Q.No.16 is compulsory)

Q.No.	Questions	Marks	CO	BL
16.	Derive the current-voltage (I-V) equation for a PN junction diode and analyse the VI Characteristics under various biasing condition.	15	CO1	L4