ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV / DEC 2024

BIOMEDICAL ENGINEERING
III Semester
BM23302 & ELECTRONIC DEVICES AND CIRCUITS
(Regulation 2023)

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 is the Einstein relation in the context of diffusion current?	2	CO1	L1
2	What is the ripple factor value of HWR and FWR.	2	CO1	L2
3	A common base amplifier has an emitter current of 10 mA and a collector current of 9.5 mA. Calculate the current gain α and β	2	CO5	L3
4	Draw the transfer characteristics of n-JFET.	2	CO5	L2
5	What is small signal analysis in amplifier circuits?	2	CO4	L2
6	Sketch the circuit diagram of a CC amplifier and state its characteristics	2	CO4	L2
7	Define CMRR	2	CO2	L2
8	Calculate the overall efficiency of a transformer-coupled class A power amplifier	2	CO2	L2
9	What are the Key Advantages of Using Negative Feedback in Amplifier Design?	2	CO3	L2
10	In Colpitts oscillator C1 = C2 = C and L = 47µH, the frequency of oscillation is 1KHz. Determine the value of capacitor	2	CO3	L3

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

Q.No.	Questions	Marks	CO	BL
11 (a)	i) A PN Junction diode at reverse bias of 5V offering 10pF capacitance. At reverse bias of 10V, what is the capacitance offered by same step graded junction if V_0 = 0.7V.	6	CO1	L3
	ii) A Zener diode operating in breakdown region with Zener voltage = 10V, Series resistance = 1KΩ and Load resistance = 1KΩ. The maximum power dissipation of a diode is 0.15W and knee current is 0A. Calculate the range of input voltage.	7	CO1	L4
OR				
11 (b)	Compare and contrast Half-Wave Rectifier (HWR) and Full-Wave Rectifier (FWR)	13	CO1	L4

12 (a)	Describe the operating characteristics and current gain of CB, CE, and CC BJT configurations.	13	CO5	L4
	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	L4
	ii) Explain the structure and analyse the characteristics of a Unijunction Transistor (UJT)	7	CO5	L4
13 (a)	Using the h-parameter model, derive the expression for the voltage gain (Av) and current gain (Aı) of a CE amplifier, including the effects of input and output impedances.	13	CO4	L5
	OR			
13 (b)	Draw the circuit diagram of a source follower amplifier using a MOSFET and derive expressions for the voltage gain, input resistance and output resistance	13	CO4	L5
14 (a)	Using AC analysis, derive the expressions for Common mode and Differential mode of a differential amplifier.	13	CO2	L4
	OR			
14 (b)	Derive the efficiency of different power amplifier configurations using AC analysis.	13	CO2	L4
15 (a)	Evaluate the Input and Output Resistance for the Voltage shunt 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 RC phase shift oscillator using BJT with Phase Lead RC network, Phase Lag RC network and one RC – one CR filters 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.	i) Derive an expression for maximum electric field and depletion width for a PN junction diode.	8	CO1	L4
	ii) Perform stability analysis of self bias and voltage divider bias circuit of BJT and derive for stability factor	7	CO2	L4