Total number of printed pages: **UG/4th/UECE402**

2025

ANALOG CIRCUITS

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	a)	What is meant by the threshold or cut in voltage? Why its value is higher for silicon than that for germanium?	(2+2=4)
	b)	Plot the volt-ampere curve for a P-N diode and explain the nature of this curve.	(6)
	c)	What is the effect of temperature on P-N Junction diodes? Explain.	(4)
	d)	Differentiate between P-N Diode clipping circuit and P-N Diode clamping circuit.	(6)
2.	a)	Why input resistance is low in the common base and common emitter and very high in the common collector configuration. Explain.	(4)
	b)	Define load line and Q point of a transistor amplifier. Explain graphically the operation of a transistor as an amplifier. Mention the advantages and disadvantages of the graphical analysis.	(2+4+3=9)
	c)	Explain how phase reversal of the signal takes place when it is amplified by single stage voltage amplifier.	(3)
	d)	A transistor has I_B = 105μA and I_C = 2.05 mA. Find (a) β of transistor (b) α of transistor (c) emitter current I_E (d) Now, if I_B changes by 27 μA and I_C changes by +0.65 mA, find the new value of β.	(4)
3.	a)	In a transistor amplifier, when the signal changes by 0.04 V, the base current changes by 20μA and collector current by 2 mA. If collector load R_C = 5 KΩ and R_L = 15 KΩ find: (i) current gain, (ii) input impedance, (iii) a.c. load (iv) voltage gain and (v) power gain.	(5)
	b)	In a transistor amplifier, R_C = 10 KΩ, R_L = 30 KΩ and V_{CC} = 20V. The value of R_1 and R_2 are so as to fix the operating point at 10V, 1 mA. Draw the d.c. and a.c. load lines. Assume R_e is negligible.	(5)
	c)	Compare the performance of CB, CE and CC amplifier. Which amplifier mode is suitable for cascading and why?	(5+5=10)

4.	a)	What do you understand by transistor biasing? Name the different methods used for transistor biasing.	(3+1=4)
	b)	Sketch CE NPN transistor with base resistor biasing method and explain its circuit diagram in details.	(6)
	c)	Explain the circuit analysis of the collector to base bias method by using the circuit diagram.	(6)
	d)	(i) A germanium transistor is to be operated at zero signal I_C = 1 mA. If the collector supply V_{CC} = 10V, what is the value of R_B in base resistor method? Take β = 100. (ii) If another transistor of the same batch with β = 50 is used, what will be the new value of zero signal I_C for the same R_B.	(4)
5.	a)	Define Power amplifier. Also explain its significance and why it is required in the electronic circuits.	(2+4=6)
	b)	Define the following terms: Class A operation, Class B operation, Class C operation	(6)
	c)	Define class A power amplifier. Also explain its output characteristics by considering power drawn, power dissipation and power developed in the collector load with proper equation and diagram.	(8)
6.	a)	Draw the block diagram of a negative feedback amplifier. Derive an expression for the voltage gain of an amplifier of gain A when subjected to negative feedback with a feedback fraction β.	(1+5=6)
	b)	In a negative feedback amplifier, A=100, β = 0.04 and V_S = 50 mA. Find (a) gain with feedback (b) output voltage (c) feedback factor (d) feedback voltage.	(4)
	c)	Differentiate between all types of feedback by comparing their characteristics.	(6)
	d)	Define reflected load used in the transformer coupled class A amplifier. Also explain its importance in the circuit.	(1+3=4)
7.	a)	Differentiate between amplifier and oscillator.	(3)
	b)	Give a classification of oscillators based on the frequency ranges they can generate.	(4)
	c)	Can a negative feedback amplifier work as an oscillator? If yes, how? If not, why?	(6)
	d)	State Barkhausen criterion of oscillation of an oscillator. Also point out the importance of the function of feedback circuit in the above mentioned criterion.	(7)