2024

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)	Why input resistance is low in the common base and common emitter and very high in the common collector configuration. Explain.	(4)
	c)	A transistor has $I_B = 105\mu A$ 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)
	d)	Compare the performance of CB, CE and CC amplifier. Which amplifier mode is suitable for cascading and why?	(3+5=8)
2.	a)	By considering the transistor amplifier, explain whether the a.c. load line is same as the d.c. load line with all necessary changes required in the amplifier circuit.	(6)
	b)	By using graphical method, calculate the gain of the transistor amplifier with proper diagram.	(5)
	c)	In a transistor amplifier, when the signal changes by 0.04 V, the base current changes by 20 μA and collector current by 2 mA. If collector load $R_C = 5$ KΩ and $R_L = 10$ KΩ find (i) current gain (ii) input impedance (iii) ac load (iv) voltage gain and (v) power gain.	(5)
	d)	Explain the circuit arrangement and operation of a common base amplifier.	(4)
3.	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	(8)

		collector load with proper equation and diagram.	
4.	a)	Define reflected load used in the transformer coupled class A amplifier. Also explain its importance in the circuit.	(2+3=5)
	b)	Explain why Q point is mention at the centre of the load line of the output voltage and current waveform in transformer coupled class A amplifier by considering the variation of collector current and collector to emitter voltage with proper circuit diagram and waveform.	(7)
	c)	For a power amplifier working in class A operation, the zero signal collector current is 100 mA. If dc supply voltage Vcc =12 V, determine (a) the maximum ac power output (b) the power rating of transistor (c) the maximum collector efficiency.	(3)
	d)	For Class A, CE amplifier, the Q point is located at Ic = 250 mA and Vce = 8 V. Due to input signal, the output collector current goes in between 450 mA and 40 mA. The Vce swings between 15 V and 1 V. Determine (a) the output power delivered (b) the input power (c) collector efficiency and (d) power dissipated by the transistor.	(5)
5	a)	Explain the working operation of the Class B power amplifier by considering its overall efficiency.	(8)
	b)	Define and explain the following terms as applied to power amplifiers: Collector efficiency, power dissipation, overall efficiency	(9)
	c)	Differentiate between amplifier and oscillator.	(3)
6	a)	Give a classification of oscillators based on the frequency ranges they can generate.	(6)
	b)	Can a negative feedback amplifier work as an oscillator? If yes, how? If not, why?	(6)
	c)	State Barkhausen criterion of oscillation of an oscillator. Also point out the importance of the function of feedback circuit in the above mentioned criterion.	(8)
7.	a)	Describe the working operation of Hartley Oscillator.	(8)
	b)	Describe the working operation of Colpitt's oscillator.	(8)
	c)	Differentiate between above two.	(4)