Name: **Enrolment No:**	

UPES

End Semester Examination, December 2024

Course: Analog Systems and Applications **Semester: III**

Program: BSc Physics with Research **Time : 03 hrs.**

Course Code: PHYS2025 **Max. Marks: 100**

Instructions: Use of scientific calculators is allowed. Q9 and Q10 are having internal choice.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Calculate I_E in a transistor if $\beta = 50$ and $I_B = 20\ \mu A$.	**4**	**CO1**
Q2	A power transistor working in class A operation has zero signal power dissipation of 10 watts. If the a.c. output power is 4 watts find; (i) Collector efficiency, (ii) power rating of transistor.	**4**	**CO2**
Q3	With a negative feedback, an amplifier gives an output of 10 V with an input of 0.5V. when feedback is removed, it requires 0.25 V input for the same output. Calculate, (i) gain without feedback, (ii) feedback fraction.	**4**	**CO2**
Q4	Measurements of a circuit gives the following h-parameters; h_{11} = 10 kΩ, h_{12} = 0.5, h_{21} = 100, h_{22} = 2 mS. Find v_1, i_2, if i_1 = 1mA, v_2 = 2V.	**4**	**CO3**
Q5	Discuss the principle and working of Photo-diodes with V-I characteristics.	**4**	**CO1**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Why filter circuits are needed? Give types of Filter circuits. Discuss the circuit diagram of π-section filter circuit by explaining the role of each element in rectification.	**2+2+6 = 10**	**CO2**
Q7	What is phase reversal? Describe a phase reversal for a CE mode transistor by developing a load line and Q point.	**10**	**CO2**
Q8	Analyze the gain in negative feed-back amplifier. Discuss the, (i) gain stability, (ii) input impedance for negative feedback.	**10**	**CO4**
Q9	What is R-C coupled amplifier? Derive an equivalent circuit for it and discuss the frequency response at low, mid and high frequency regions. **Or** How transistor amplifies a signal and why the phase of a signal voltage and output voltage undergoes a phase reversal? Provide a transistor circuit in CE mode for phase reversal and, also, analyze the graphical parameters (I_C, V_{CE}, and I_B) for typical phase reversal phenomena.	**10**	**CO3**

SECTION-C (2Qx20M=40 Marks)			
Q10	Derive and Apply the Barkhausen criterion for sustained oscillations and, thus, discuss the Tuned collector Oscillator and formulate its output frequency. **Or** Discuss the circuit operations, by emphasizing the role of each component, of; (i) Colpitt's oscillator, (ii) Hartley's oscillator. And, also, evaluate output frequency of each oscillator by addressing the advantage/disadvantage of one over the other oscillator.	**20**	**CO3**
Q11	Formulate the voltage gain, by discussing the principle and working, of; (i) Non-inverting amplifier, (ii) Voltage follower, (iii) Subtractor, (iv) Integrator.	**20**	**CO4**