

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2023****Subject Code:3141002****Date:07-07-2023****Subject Name:Analog Circuit Design****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Define PSRR, Slew Rate, and Output Offset voltage.	03
	(b) Draw the schematic diagram of the OP-AMP and its equivalent circuit.	04
	(c) Sketch the circuit of Phase-shift Oscillator using BJT and obtain its frequency of oscillation.	07
Q.2	(a) Write short note on validity of hybrid- π model.	03
	(b) List the parameter those affecting to the transistor at high frequencies.	04
	(c) Derive the expression for the CE short-circuit current gain A_i as a function of frequency.	07
OR		
	(c) Explain in detail the working principle of a crystal oscillator.	07
Q.3	(a) What is feedback in amplifiers? Compare and contrast the effects of negative and positive feedback on amplifier performance.	03
	(b) With $g_m = 50 \text{ mA/V}$, $r_{b'e} = 1 \text{ K}$, $C_e = 1 \text{ pF}$ and $C_c = 0.2 \text{ pF}$, determine the values of f_β and f_T .	04
	(c) List and explain characteristics of amplifier which are modified by negative feedback.	07
OR		
Q.3	(a) The nominal gain (A_f) of an amplifier with feedback is 20, and a variation of 5% is permissible. If the magnitude of the return ratio ($A\beta$) is 1000, then determine the minimum value of the open loop gain (A) and the maximum permissible variation in it.	03
	(b) Draw the four types of feedback amplifier topologies.	04
	(c) Draw and explain triangular wave generator using OP-AMP	07
Q.4	(a) What do you mean by Voltage regulator? List different types of voltage regulators.	03
	(b) Sketch the OP-AMP based sample-and-hold circuit and explain its operation.	04

- (c) Sketch and explain the operation of an A-stable multivibrator based on a 555 timer? **07**

OR

- Q.4** (a) Briefly explain class A power amplifier. **03**
(b) Draw block diagram of Phase Locked Loop (PLL) and briefly explain its working. **04**
(c) Write a short-note on class-B push-pull power amplifier **07**

- Q.5** (a) Explain the difference between a band-stop filter and a band-pass filter. **03**
(b) With respect to filters define followings (i) Pass Band (ii) Stop Band (iii) Attenuation (iv) Cut-off frequency. **04**
(c) Write a short-note on Transformer Coupled Audio Power Amplifier **07**

OR

- Q.5** (a) 555 based A-stable multivibrator is constructed using the following components: **03**
 $C = 0.01 \mu\text{F}$, $R_1 = 10\text{K}\Omega$, $R_2 = 50\text{K}\Omega$.
Calculate the output frequency from the 555 oscillator and the duty cycle of the output waveform.
(b) How do active filters differ from passive filters? Briefly explain **04**
(c) Explain in detail Sallen-Key second-order low-pass filter. **07**
