

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2021****Subject Code:3141002****Date:03/09/2021****Subject Name:Analog Circuit Design****Time:02:30 PM TO 05:00 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) List out characteristics of ideal op-amp.	03
(b) Write short note on validity of hybrid- $\pi$ model.	04
(c) Draw Wien-bridge oscillator circuit and obtain its frequency of oscillation.	07
Q.2 (a) Give two Barkhausen conditions required in order for sinusoidal oscillations to be sustained.	03
(b) Draw Hybrid-pi equivalent circuit for CE transistor. Also derive the equation of transconductance $g_m$ .	04
(c) Derive the expression for the CE short-circuit current gain $A_i$ as a function of frequency.	07
<b>OR</b>	
(c) Briefly explain the four topologies of feedback amplifier.	07
Q.3 (a) The nominal gain ( $A_f$ ) of an amplifier with feedback is 20, and a variation of 5% is permissible. Consider magnitude of the return ratio ( $A\beta$ ) is 1000. Determine the minimum value of the open loop gain ( $A$ ) and the maximum permissible variation in it.	03
(b) Write a short-note on crystal oscillator.	04
(c) Write a short-note on Advantages of negative feedback in amplifiers.	07
<b>OR</b>	
Q.3 (a) Draw the circuit of transistor based Emitter-coupled differential amplifier.	03
(b) Derive the expression of input resistance ( $R_{if}$ ) for voltage-series feedback amplifier circuit.	04
(c) Write a Short-note on OP-AMP based Integrator circuit.	07
Q.4 (a) Draw the Internal block diagram of 555 timer chip.	03
(b) Explain the working of Monostable multivibrator using 555 timer IC.	04
(c) Sketch the circuit of triangle wave generator and explain its operation.	07
<b>OR</b>	
Q.4 (a) What are the advantages of the adjustable voltage regulators over the fixed voltage regulators?	03
(b) List the advantages and disadvantages of the ECL gate.	04
(c) Draw block diagram of Phase Locked Loop (PLL) and briefly explain its operation.	07
Q.5 (a) For an Astable multivibrator using 555 timer, $R_A = 2.2K\Omega$ , $R_B = 3.9K\Omega$ and $C=0.1 \mu F$ , determine the positive pulse width, negative pulse width and free running frequency.	03
(b) Write a short-note on PLL based frequency multiplier application	04
(c) Explain in detail Sallen-Key second-order low-pass filter.	07
<b>OR</b>	
Q.5 (a) Discuss the difference between active and passive filter.	03
(b) Briefly explain second-order All-pass Filter.	04
(c) Write a short-note on class-B push-pull power amplifier	07

\*\*\*\*\*