Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV EXAMINATION – SUMMER 2020

Subject Code: 2141002 **Date:27/10/2020**

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.**

			MARKS
Q.1	**(a)**	Draw simplified internal block diagram of 555 Timer IC.	**03**
	(b)	Draw and explain typical connection diagram of 78XX series voltage regulator. Also explain drop out voltage.	**04**
	(c)	Derive the expression for the CE short-circuit current gain A_i as a function of frequency.	**07**
Q.2	**(a)**	Define followings: *(i)* Input offset voltage *(ii)* CMRR *(iii)* PSRR.	**03**
	(b)	For Hybrid-π transistor model g_m = 50 mA/V, $r_{b'e}$ = 1 K, C_e = 1 pF, and C_c = 0.2 pF is given then determine the values of f_β and f_T.	**04**
	(c)	Explain in detail transistor phase-shift oscillator and also derive expression for the frequency.	**07**
		OR	
	(c)	Draw Wien-bridge oscillator circuit and obtain its frequency of oscillation.	**07**
Q.3	**(a)**	Draw and explain block diagram of typical OP-AMP.	**03**
	(b)	List out characteristics of ideal OP-AMP.	**04**
	(c)	What is Slew rate? What are its causes? Derive expression for maximum frequency of operation for desired output swing in terms of slew rate?	**07**
		OR	
Q.3	**(a)**	Draw equivalent circuit of an OP-AMP.	**03**
	(b)	Write a brief note on emitter-coupled Differential Amplifier.	**04**
	(c)	What is instrumentation amplifier? With help of neat diagram explain operation of Three OP-AMP based Instrumentation amplifier.	**07**
Q.4	**(a)**	Briefly explain Inverting Amplifier in open loop mode.	**03**
	(b)	Explain the circuit of voltage to current converter with floating load.	**04**
	(c)	Draw and explain closed-loop differential amplifier with one OP-AMP and derive voltage gain equation.	**07**
		OR	
Q.4	**(a)**	Briefly explain operation of basic differentiator circuit.	**03**
	(b)	Draw and explain OP-AMP based Voltage-shunt feedback amplifier. Derive closed-loop voltage gain equation for the same.	**04**
	(c)	Explain in detail inverting Schmitt trigger circuit.	**07**
Q.5	**(a)**	Briefly explain Peaking Amplifier.	**03**
	(b)	With reference to filter design define following terms: *(i)* Pass band *(ii)* Stop band *(iii)* Attenuation *(iv)* Cut-off frequency	**04**
	(c)	Show how Biquad circuit can be used as a universal filter?	**07**

OR

Q.5	**(a)**	Draw and explain briefly Zero crossing detector circuit.	**03**
	(b)	Design a first order low-pass filter for the following specifications: (*i*) Passband voltage gain = 2 (*ii*) Cut-off frequency f_c = 10 Khz.	**04**
	(c)	With help of circuit diagram, explain operation of first order Butterworth low-pass filter.	**07**

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