

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III (NEW) EXAMINATION – SUMMER 2021****Subject Code:3130305****Date:11/09/2021****Subject Name:Advanced Electronics****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) What is hybrid relay? With neat diagram explain working of hybrid relay, mention advantage of hybrid relay over SSR relay.	03
(b) Draw the circuit diagram of op-amp based voltage series feedback amplifier and derive expression of its voltage gain. What will happen if we short R_1 and R_f ?	04
(c) Design a first order low pass filter for a high cut-off frequency of 2KHz and pass band gain of 2.	07
Q.2 (a) Draw the circuit of a V-I converter and derive an expression for the output current in terms of input voltage.	03
(b) With help of small signal NPN transistor design a simple switching circuit to operate a relay which in turn switches a BULB ON and OFF. Mention the type of transistor configuration used.	04
(c) Design a $\pm 5V$ dual regulated power supply. Considering dc load current of 10 mA and capacitor of $1000\mu F$ calculate V_{rip} .	07
OR	
(c) Design a $\pm 12V$ dual regulated power supply. Considering dc load current of 10 mA and capacitor of $470\mu F$ calculate V_{rip} .	07
Q.3 (a) Draw the circuit diagram of op-amp differentiator and derive an expression for the output in terms of the input. Write down steps to design a workable/practical differentiator circuit.	03
(b) Explain the following terms related to a practical Op-Amp in brief and equations wherever necessary, a) Band Width b) Slew Rate c) Input Offset Voltage d) Common Mode Rejection Ratio (CMRR) e) Input Bias Current f) Input Offset Current.	04
(c) Design a second order active high pass filter for a cutoff frequency of 5 KHz	07
OR	
Q.3 (a) Draw the sample and hold circuit using op-amp. Explain its working and show input and output waveform.	03
(b) Draw circuit for differential amplifier with three op-amps and derive equation for voltage gain.	04
(c) Design a second order active low pass filter for a cutoff frequency of 2 KHz.	07
Q.4 (a) Explain Phase lock loop with schematic and necessary waveforms.	03
(b) Draw and explain triangular wave oscillator circuit with waveforms.	04

- (c) Design a phase shift oscillator so that f_o (frequency of oscillation) = 200. Assume gain of 29. **07**

OR

- Q.4** (a) For a 555 astable multivibrator circuit with $R_A=3.9K\Omega$, $R_B=2.2K\Omega$ and $C=0.1\mu F$ find out positive pulse width t_c , negative pulse width t_d and free running frequency f_o . **03**

- (b) Draw and explain Wein bridge oscillator circuit with waveforms. **04**

- (c) Design a square wave oscillator so that $f_o=1KHz$. The op-amp is 741 with dc power supply = $\pm 18V$. **07**

- Q.5** (a) With neat diagram explain working of Shockley diode. **03**

- (b) With neat diagram explain operation of CLASS B power amplifier and derive equation for power gain. **04**

- (c) Draw and explain construction and working of SCR. Explain various SCR turn-on and turn-off methods. **07**

OR

- Q.5** (a) With neat diagram explain basic construction and operation of UJT. **03**

- (b) With neat diagram explain operation of CLASS A power amplifier and derive equation for power gain. **04**

- (c) Draw and explain construction and working of TRIAC. Also design a simple AC power control circuit using TRIAC. **07**