Reg No.:_____ Name:_____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (S, FE) / S3 (PT) (S) Examination June 2024 (2019 Scheme)

Course Code: ECT 301

Course Name: LINEAR INTEGRATED CIRCUITS

Max. Marks: 100 Duration: 3 Hours

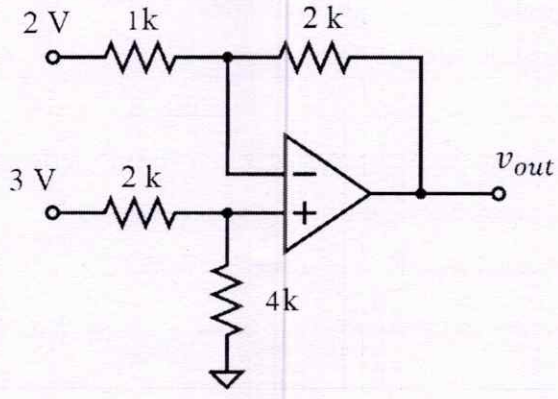
PART A

(Answer all questions; each question carries 3 marks) Marks

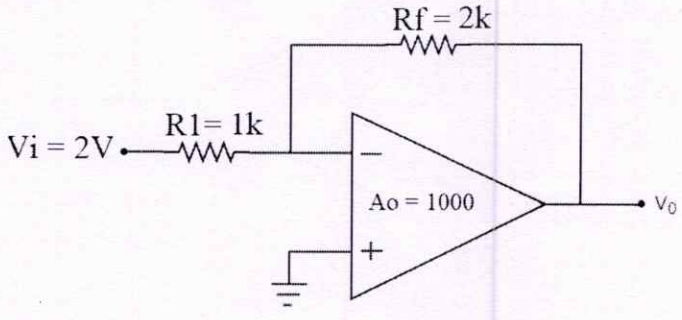
1 Draw the equivalent circuit of an op-amp and list the component values of the modelled circuit to work as an ideal op-amp. 3

2 Find the maximum possible frequency, without distortions , for a sine wave of voltage 12V peak to peak with an op-amp whose slew rate is 10V/μs. 3

3 Calculate Vout for the circuit shown below. 3



4 Find Vo, if open loop gain of the below op-amp is 1000. 3



5 How Barkhausen criteria is achieved in RC phase shift oscillator? 3

6 List the advantages of an Op-amp based active filter over conventional passive filters. 3

7		What does NE and 555 in NE555 timer IC stands for?	3
8		Design a monostable multivibrator using 555 to get a pulse width of 10ms.	3
9		Explain Line regulation and Load regulation.	3
10		Find the resolution of a 10 bit ADC with 5V full scale reading.	3

PART B

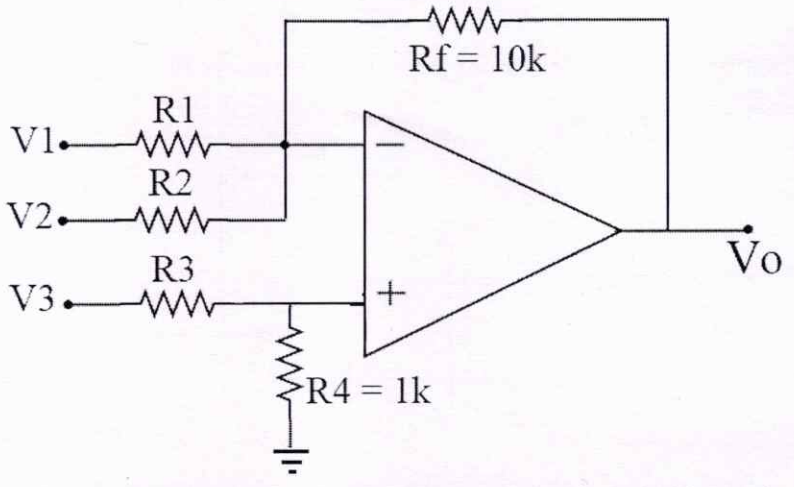
(Answer one full question from each module, each question carries 14 marks)

Module -1

11	a)	Explain the principle of operation of Widlor current mirror and its advantages? Deduce the expression for its current gain.	8
	b)	Draw and explain the voltage transfer curve and frequency response curve of an op-amp.	6
12	a)	Derive CMRR, input resistance and output resistance of a dual input balanced output differential amplifier configuration.	8
	b)	Explain the following properties of a practical opamp (i) Bandwidth (ii) Slew rate (iii) Input offset voltage (iv) CMRR	6

Module -2

13	a)	Derive the following characteristics of a voltage series amplifier: i) Closed loop voltage gain ii) Input resistance iii) Output resistance iv) Bandwidth	8
	b)	Find the values of resistors R1,R2 and R3 so that Vo = −10 V1 − 5 V2 + 4 V3	6



14	a)	With necessary equations and waveforms explain the working of a schmitt trigger circuit with different values for upper and lower threshold. Also design such a Schmitt trigger circuit with V_{UT} = 9V and V_{LT} = -7V. Assume saturation voltage levels as 12V and -12V.	8

b) Draw and explain precision full wave rectifier circuit. Include equivalent circuits for positive and negative half cycles. 6

Module -3

15 a) Draw and explain the working of an op-amp based RC phase shift oscillator. Also derive the equation for frequency of oscillation. 8

b) Draw the circuit of a state variable filter and derive the transfer function of high pass filter response in it. 6

16 a) Draw and explain the working of an op-amp based triangular wave generator. Also derive the equation for frequency of oscillation. 8

b) Design a 50Hz twin- T notch filter with a Q factor of 15. 6

Module -4

17 a) Using internal diagram of NE555 IC, explain the working of symmetric astable multivibrator circuit. 7

b) Using internal block diagram of NE 566 explain the working of VCO. 7

18 a) Using internal diagram of NE555 IC explain the working of monostable multivibrator circuit. Write the necessary condition for the trigger voltage level? 7

b) Explain the working of Phase Locked Loop and its application as a frequency multiplier circuit. 7

Module -5

19 a) Explain how external current fold back protection is achieved while designing voltage regulator using IC 723. 7

b) Find the output voltage for the following DACs having an output voltage range of 0 to 10V. 7

i) 0110 for a 4 bit DAC

ii) 10111100 for an 8 bit DAC

iii) 1010100011 for a 10 bit DAC

20 a) Design a voltage regulator using IC 723 for an output voltage of 5V and current of 2A. Assume Vref = 7V. Also explain how line regulation is achieved in it. 7

b) With a neat diagram explain the working of successive approximation type ADC 7

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