Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent Institution of MAHE, Manipal)

IV SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL 2018

SUBJECT: ANALOG SYSTEM DESIGN [ELE 2204]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 27 April 2018** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. Assuming op-amp as ideal, find voltage gain, I_{R1}, I_{R3}, I_L and Vo in the circuit shown in Fig Q1a. ***(05)***

1B. Using single op-amp powered by ±12V batteries, realize a circuit which produces an output $= 5 - 10\,Vi$, where Vi is an input signal. Assume a resistance of 10 kΩ to be connected between inverting and output terminal of the op-amp. ***(03)***

1C. An op-amp 741 has a slew rate of 0.5V/µsec. Determine

a) The slew rate limited cut off frequency for the voltage follower circuit, if peak to peak value of sinewave output is 12V

b) The peak to peak value of undistorted output voltage of the above circuit when operated at 500khz. ***(02)***

2A. Design an op-amp based circuit which converts an input triangular wave having frequencies of range 200Hz to 6Khz into a square wave, Assume C=0.1µf if required. Plot the gain versus frequency graph, mark all critical frequency points and region of differentiarion. ***(03)***

2B. An audio output of CD player contains signals from 10Hz to 20kHz when playing a music track. Develop a suitable circuit to listen only the piano track in the speaker by refering the table given below. Ensure the gain rolls off at the rate of 20dB/dec with passband gain of 27.9588dB. Assume C=0.1µf if required and Rf=10kΩ.

Instrument	Range of frequency
Drum	80-100Hz
Piano	500Hz-5KHz
Saxophone	70Hz-90Hz
Noise due to swithing	15KHz and above

(04)

2C. Design an op-amp based circuit to get a lagging phase shift of 30°, for an input of frequency 2kHz, assume C=0.1µf if required. Also draw the circuit to obtain a phase lead of 30°. ***(03)***

3A. Realize a circuit to implement a VTC as shown in Fig Q3a. Assume Vsat=±12V, Input is 10sinwt. Draw the input and output waveforms with transition points. Assume Rf=10k. ***(03)***

3B. For an op-amp based triangular wave generator, Prove that the frequency of oscillation is independent of Vsat of the OPAMP. ***(03)***

3C. Using 555 timer, develop a circuit to get a square wave of 5kHz frequency, which triggers another 555 timer which produces a pulse of width of 125μs. Make sure that the timer doesn't mistrigger. Assume C=0.1μf if required. Draw the output waveforms of both the timers. ***(04)***

4A. Explain the role of op-amp in precision rectifier. Explain the full wave rectification with circuit diagram and waveforms. ***(04)***

4B. With a neat circuit diagram explain the working of Voltage controlled oscillator? What is the role of integrator in VCO ? ***(03)***

4C. Design phase shift oscillator which generates a sinusoidal waveform of frequency 3khz. Assume Rf=10k and C=0.1μf if required. ***(03)***

5A. Discuss the importance of instrumentation amplifier with relevant expressions. ***(03)***

5B. 'Negative feedback stabilizes the voltage gain'. Justify this statement with suitable derivation. ***(03)***

5C. Derive expressions for input and output resistances with feedback which employs current series feedback. Also mention the ideal values of input and output resistance of this topology. ***(04)***

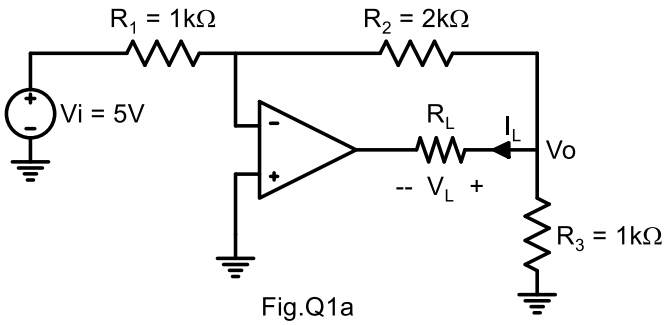

Fig.Q1a

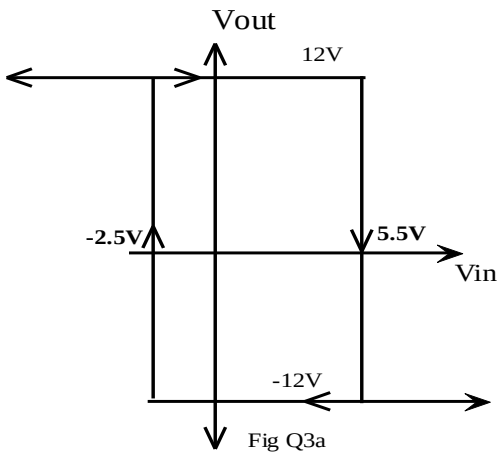

Fig Q3a