Reg.No.									

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

FOURTH SEMESTER B.S. DEGREE EXAMINATION – OCT. / NOV. 2017

SUBJECT: IC SYSTEMS (EC 243)

(BRANCH: E&C and E&E)

Friday, 03 November 2017

Time: 3 Hours **Max. Marks: 100**

- ✓ **Answer ANY FIVE full Questions.**
- ✓ **Missing data, if any, may be suitably assumed**

1A) Draw the circuit of an emitter coupled differential amplifier. Derive an expression for CMRR. Explain how CMRR can be improved by using current mirror circuit. Find the difference between V_2 & V_1 assuming identical transistors with large β value for the circuit shown in Fig. Q1A.

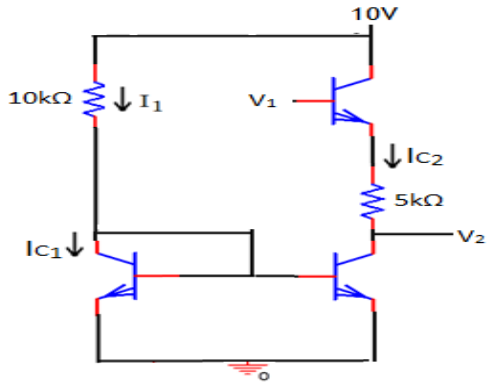

Fig. Q1A

1B) Write short note on the classification of feedback.

1C) Draw the circuit diagram of RC phase shift oscillator and explain its operation.

(10+6+4)

2A) Analyze and determine the expression of the output voltage for the circuit shown in Fig. Q2A(i) & Q2A(ii).

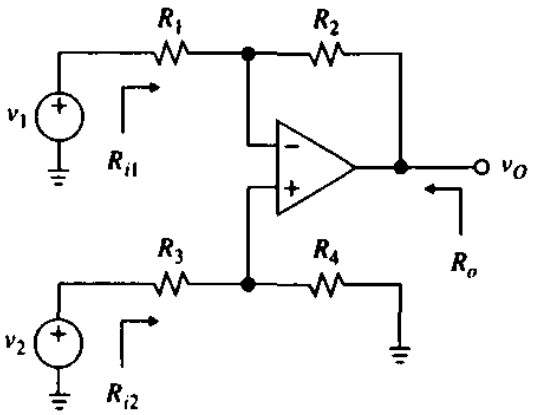

Fig. Q2A(i)

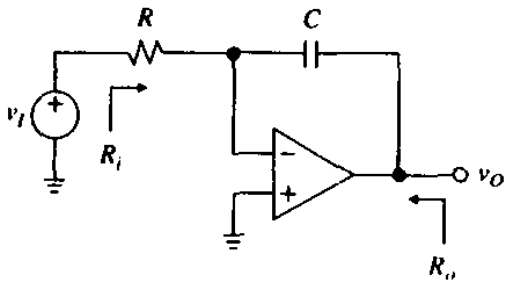

Fig. Q2A(ii)

2B) Draw a non-inverting amplifier using OP-AMP. Derive the expression for the voltage gain assuming ideal conditions. Design the circuit to obtain voltage gain of 20. Draw the output waveform for the input signal (i) $V_i = 0.5\sin(3140\,t)$ (ii) $V_i = 3\sin(3140\,t)$ Use supply voltage ±12V. **(10+10)**

3A) Draw the circuit diagram of 4-bit binary weighted resistor DAC and explain its operation. Convert the following input into equivalent analog output. i) 1111 ii) 0011. With R=10kΩ, R_F = 1kΩ. Draw the output waveform for decimal equivalent of binary input. What are the drawbacks of this DAC?

3B) Draw the circuit diagram of Log and Anti-Log amplifiers using OP-AMP. Derive the output voltage expressions. **(10+10)**

4A) i) Explain the working of mono-stable multivibrator using OP-AMP with the help of neat circuit diagram and waveforms. Derive the expression for monoshot time. ii)Design a square wave oscillator using OP-AMP for f_o = 1 kH_z. Assume $R_1 = 1.16R_2$ and C = 0.05 µF.

4B) Design a circuit using IC 555 timer to obtain a square wave of frequency 1 kHz for duty cycle of (i) 25% (ii) 50% (iii) 75%. Derive the equations used. Assume C = 0.1 µF.

(10+10)

5A) Draw the functional diagram of OP-AMP and explain each block.

5B) Define the following terms with respect to OP-AMP:

a) Slew Rate
b) Output offset voltage
c) Common mode gain
d) Output resistance

5C) Draw the circuit of an 8-bit successive approximation type ADC. Explain the conversion process with an example. List the names of other ADCs.

(5+5+10)

6A) Draw the circuit of second order Butterworth active High pass filter and derive the expression for $A_V(s)$.

6B) Explain the functional blocks of PLL. How it is used as frequency multiplier?

(10+10)

7A) Design a second order Butterworth low pass filter having cut off frequency of 1 kHz. Draw to scale its frequency response graph (gain (d_B) vs frequency) if $A_V = \frac{A_{VO}}{\sqrt{\left(1+\frac{f}{f_c}\right)^4}}$.

Assume capacitor is 0.01 µF.

7B) Mention any two important criteria for a good instrumentation amplifier. Draw the circuit diagram of instrumentation amplifier and derive the expression for V_O.

7C) With neat circuit diagram, discuss the method to use three terminal fixed voltage regulator as a current source. Show that it is possible to boost the output current of a three terminal regulator. Derive the necessary expressions. **(5+5+10)**

8) Write short note on the following:

A. Series and Switching regulator
B. Fixed Voltage Regulator
C. Inverting Schmitt trigger
D. Analog Divider **(5×4)**