Reg.No.									

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

FOURTH SEMESTER B.S. DEGREE EXAMINATION – APRIL/ MAY 2017

SUBJECT: IC SYSTEMS (EC 243)

(BRANCH: E&C and E&E)

Thursday, 27 April 2017

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

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

1A) Draw the schematic diagram of feedback amplifier and derive the expression for A_f. What are the advantages of negative feedback? What are the functions of feedback network in the oscillators?

1B) With the help of circuit diagrams, derive the expression for CMRR of an emitter coupled differential amplifier using small signal model of a transistor. What is the drawback of this circuit? **(10+10)**

2A) i) Draw the circuit diagram of an ideal inverting amplifier using OP-AMP and derive the expression for the output voltage. Modify this circuit so that it works as sign changer and justify your answer. ii) For the differential amplifier the first set of signal is V_1 = 50µV & V_2 = -50µV and second set of signal is V_1 = 1050µV & V_2 = 950µV. If the CMRR is 10000, calculate the percentage difference in the output voltage obtained for the two sets of input signals.

2B) Define the following terms with respect to OP-AMP:

a) Slew Rate
b) Input bias current
c) Common mode gain
d) Output resistance

2C) Draw the circuit diagram of RC phase shift oscillator and explain its operation. **(10+6+4)**

3A) Design a summing amplifier using OP-AMP to give the output voltage $V_O = -2V_a + 2.5V_b - 1.5V_c$. Where V_a, V_b and V_c are the input signals. Use feedback resistor of 2 kΩ.

3B) Draw the circuit diagram of voltage to current converter (both types) and derive the necessary expressions.

3C) Draw the circuit diagram of instrumentation amplifier and derive the expression for V_O. **(4+10+6)**

4A) Design a second order Butterworth low pass filter with a cutoff frequency of 1 kHz and low frequency gain of 10. Assume R=15.9kΩ.

4B) Draw the circuit of second order active band pass filter and derive the expression for $A_V(s)$.

4C) Write short note on the following:

A. Sample and Hold circuit
B. Peak detector using OP-AMP **(5+5+10)**

5A) Draw the circuit diagram of triangular wave generator using OP-AMP and derive the necessary equations. Explain its operation with waveform. Assuming the supply ±12V and C=0.1μF, design a circuit to obtain a triangular waveform of 2V peak value&5 kHz frequency.

5B) Draw the circuit diagram of precision full wave rectifier and explain its operation with necessary equations. Sketch input and output voltage waveforms.

5C) Draw the circuit diagram of 4-bit binary weighted resistor DAC and explain its operation. Convert the following input into equivalent analog output. i) 0001 ii) 0011. Use R=10kΩ, R_F = 1kΩ. **(10+5+5)**

6A) Draw the circuit diagram of Astable Multivibrator for variable duty cycle using IC 555 and explain its operation with neat waveform and expression. Modify this circuit to obtain 50% duty cycle output waveform and give the necessary equations.

6B) Mention any four applications of analog multiplier. Draw the circuit and waveforms of non-inverting comparator and explain its working principle.

6C) Draw the circuit diagram of inverting Schmitt trigger. Explain its operation with waveforms and necessary equations. **(10+5+5)**

7A) Draw the functional diagram of 555 timer and explain its operation. Explain the function of following pin no's 4, 5, 6 and 7.

7B) Draw the basic block schematic of the PLL and explain each block. Define Lock-in range, Capture range and Pull-in time. **(10+10)**

8A) Write short note on the following:

A. Log Amplifier using OP-AMP
B. Differentiator using OP-AMP

8B) Draw the functional block diagram of a 723 regulator IC. Explain with circuit diagram, How a positive low-voltage regulator can be made using 723 IC?

(10+10)