Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

III SEMESTER B.TECH. (MECHATRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2017

SUBJECT: Linear Integrated Circuits & Applications [MTE 2104]

REVISED CREDIT SYSTEM
(28/11/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. The railway barrier shown below **Fig.Q1 (A)**, has been designed and manufactured for a model railway system. The motor inside the post drives the barrier up and down. The motor is the output to an Electronic circuit. Suggest name of the Electronic circuit used to control motor using op-amp and explain its operation with relevant mathematical expressions. **(3M)**

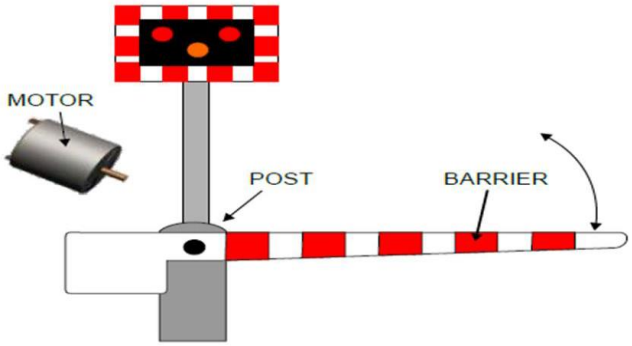

Fig.Q1 (A)

1B. Suggest an ADC which can be used for video applications. Explain its operation with the help of circuit diagram. **(4M)**

1C. For the ideal OP-AMP circuit of **Fig.Q1 (C)** shown, determine the output voltage V_o. **(3M)**

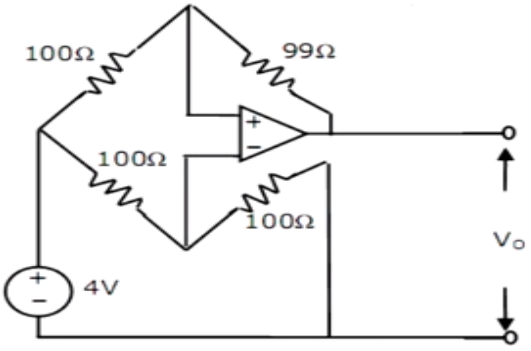

Fig.Q1 (C)

2A. A deep-fat fryer incorporates a cooking oil temperature indicator. An array of LEDs is shown on the control panel as shown in **Fig.Q2 (A)** and, as the temperature of the cooking oil increases, the LEDs light in a ladder sequence. Design suitable circuit using 741 IC. **(3M)**

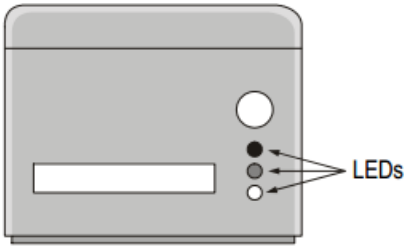

Fig.Q2 (A)

2B. Suggest a phase detector that provides linear relationship between error voltage and phase difference. Explain its operation with the help circuit diagram and relevant mathematical expressions. **(4M)**

2C. Using IC 7805(Three terminal regulator), design a current source to deliver 0.15Amp current to 20Ω, 5 watt load [quiescent current = 4.2mA for 7805 IC]. Draw the functional diagram of LM 317 with protective circuit. **(3M)**

3A. Suggest a DAC that provides relatively accurate output. Explain its operation with the help of circuit diagram and relevant mathematical expressions. **(4M)**

3B. Explain how an AM wave can be detected using 565IC **(3M)**

3C. Design a circuit using Op-amp to correct the phase angle of -90 degrees at 1kHz input frequency. **(3M)**

4A. Design a circuit using timer IC to get output frequency 1/3 of input frequency, if input frequency is 2KHZ **(3M)**

4B. Design FSK modulator using 555 timer. Use a timing capacitor C_T = 0.01 micro farads. **(3M)**

4C. Design a Narrow Band pass Filter having a center frequency of fc=2kHz, Q=20 and Af = 10 (Assume C_1=C_2=C_3=0.05uf). Also calculate the value of resistance required to change the frequency fc to 5kHz keeping gain A_f and Bandwidth constant. **(4M)**

5A. Design an inverting Schmitt trigger to generate V_{UTP} = 3V, V_{LTP} = -5V. Assume saturation voltages are +12 V and -12V. **(3M)**

5B. In the circuit shown in **Fig.Q5 (B)**, V_0=V_{0A} for switch SW in position A and V_0=V_{0B} for SW in position B.Assume op-amp is ideal.The value of V_{OB}/V_{OB} is? **(3M)**

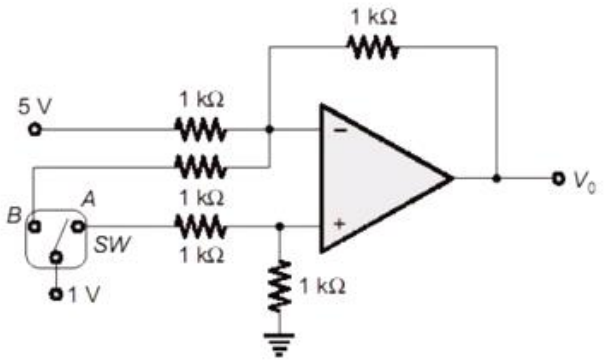

Fig.Q5 (B)

5C. What are the disadvantages of subtractor? Explain a method to overcome the disadvantages with the help of circuit diagram and relevant mathematical expressions. **(4M)**