Reg. No. | | | | | | | | | | |

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

FOURTH SEMESTER B.TECH. (INSTRUMENTATION AND CONTROL ENGG.)

END SEMESTER DEGREE EXAMINATION, APRIL/MAY - 2019

SUBJECT: ANALOG SYSTEM DESIGN [ICE 2204]

TIME: 3 HOURS MAX. MARKS: 50

Instructions to candidates :*Answer ALL questions and missing data may be suitably assumed.*

1A Design a non-inverting amplifier whose gain is variable over the range 0.5 to 5 by means of a 100k pot.

1B Draw the circuit of an instrumentation amplifier and derive the output equation. List out the advantages of the instrumentation amplifier over normal amplifier.

1C Find Vn, Vp and Vo in the circuit shown in Fig.Q1C if i_s=1mA. Find the resistance R, that when connected in parallel with the 1mA current source will cause Vo to drop to half the value found in the first case.

(2+4+4)

2A Consider the circuit in Fig.Q2A with ideal OpAmp. The IV characteristics of the diode is described by the relation $I = Io\left(e^{\frac{V_T}{V}} - 1\right)$, where V_T=25mV, I_0=1µA and V is the voltage across the diode. For an input voltage of V_i=-1V, find out the output voltage V_0.

2B Describe the working of an ideal OpAmp half wave rectifier and differentiate it between a precision diode?

2C Compare and contrast the working of a normal OpAmp integrator with a lossy integrator with regard to circuit specifications, frequency response characteristics and cut off frequencies.

(2+3+5)

3A Determine the order of a low pass Butterworth filter to provide 40dB attenuation at ω/ω_h =2 .

3B Derive the design equations for an RC Phase shift oscillator.

3C Given a bandpass filter with resonant frequency fo of 1000Hz and a bandwidth of 3000Hz, find its quality factor, low cut-off frequency and high cut-off frequency. Draw the frequency response of this filter.

(2+3+5)

4A Discuss on the necessary conditions for a circuit to work as an oscillator.

4B Describe the working of a Schmitt trigger using OpAmp and obtain the upper and lower threshold voltages.

4C Explain the working of a 555 timer as an astable multivibrator. If R_A = 2.2 KΩ, R_B = 3.9 KΩ and C = 0.1µF. Determine the positive pulse width t_c, negative pulse width t_d and free running frequency f_o.

(2+3+5)

5A Design a 555 one shot whose pulse width can be varied anywhere from 1ms to 1s using a 1MΩ pot.

5B Illustrate the working of a Successive Approximation type ADC and describe how it converts an analog signal with digital representation as 110101 to a digital output.

5C With a neat circuit diagram, explain the working of a D/A convertor using binary weighted resistors. Discuss its shortcomings.

(3+3+4)

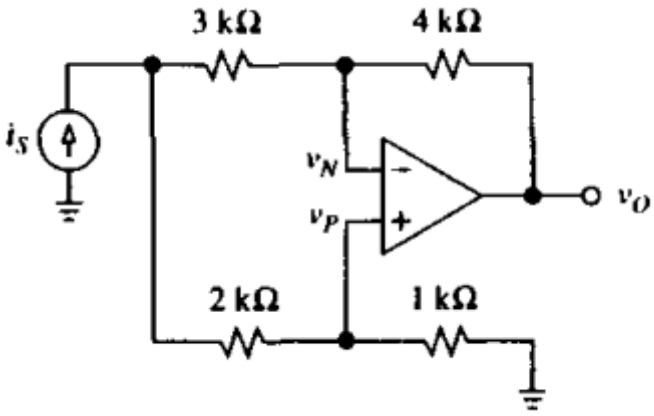

Fig.Q1C

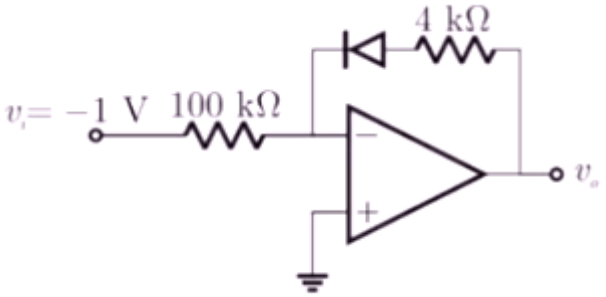

Fig.Q2A

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