Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

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A Constituent Institution of Manipal University

IV SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING) END SEMESTER EXAMINATIONS, APRIL - MAY 2017

ANALOG SYSTEM DESIGN [ELE2204]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 28, April 2017** **Max. Marks: 50**

Instructions to Candidates:

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

1A. In the circuit shown in fig Q1a, determine the signs of op-amp such that dominant feedback is negative feedback. Determine V_o/V_i. ***(03)***

1B. Using just one op-amp powered from ±12-V regulated power supplies, design a circuit to yield $V_o(\mathrm{t}) = (V_1 - 10V_2 - 5)$ V, where V_1 and V_2 are signals. Use a resistor of 10 kΩ between output and inverting terminal of the op-amp. ***(04)***

1C. What is the highest frequency of a triangle wave of 10-V peak-to-peak amplitude that can be reproduced by an op amp whose slew rate is 10V/μs? For a sine wave of the same frequency what is the maximum amplitude of output signal that remain undistorted? ***(03)***

2A. With a neat circuit diagram, derive the expression for voltage gain of 3 op-amp instrumentation amplifier. State the advantages of this circuit compared to difference amplifier used for the same purpose. ***(04)***

2B. For the circuit shown in fig Q2b, obtain an expression for output voltage in time domain. Hence comment on the working of the circuit with respect to the input applied. ***(03)***

2C. Design an op-amp based system which adds a delay of 70μs to a signal $Vi(t) = 2\sin 4000\pi t$ when passing through it. Use a capacitor of 0.1μF if required. ***(03)***

3A. Design an op-amp based system which receives an input of $Vi(t) = \sin 2000\pi t + 2\sin 12000\pi t + 3\sin 16000\pi t + \sin 30000\pi t$ to produce an output of $Vo(t) = 2\sin 2000\pi t + 2\sin 30000\pi t$. Assume that the system has maximally flat response and the transition band roll off 60dB/decade. Derive the relevant expressions which justifies the required gain to be used in the system. Use a capacitor of 0.1μF if required. ***(05)***

3B. With a neat circuit diagram and waveforms, discuss the working of a full wave precision rectifier. ***(02)***

3C. Design a suitable op-amp based circuit to obtain the output waveform shown in fig Q3c. Hence draw the voltage transfer characteristics. Assume the resistance connected between the op-amp output and non-inverting terminal as 10 kΩ. ***(03)***

4A. With a neat circuit diagram discuss the working of an op-amp based triangular waveform generator. Derive the expression for the frequency of the output. ***(03)***

4B. Design a 555 timer based circuit which can produce a pulse train of 3 kHz with 50% duty cycle. Use capacitors of 0.1μF if required. ***(03)***

4C. Design a 555 timer based circuit which can produce a pulse of 8ms along with the trigger circuit. Assume capacitors of 0.01μF if required. ***(04)***

5A. Draw the equivalent circuit of a voltage Amplifier. What conditions must be satisfied if this amplifier is to behave ideally? ***(02)***

5B. Derive expressions for input and output Resistances with feedback for a Transconductance Amplifier. ***(03)***

5C. With a neat circuit diagram, discuss the working of Opamp based voltage controlled Oscillator. ***(03)***

5D. Identify the feedback topology of the circuits shown in fig Q5d and determine the value of β if R_S=1K, R_D=5K, R_F=100K, R=10K. ***(02)***

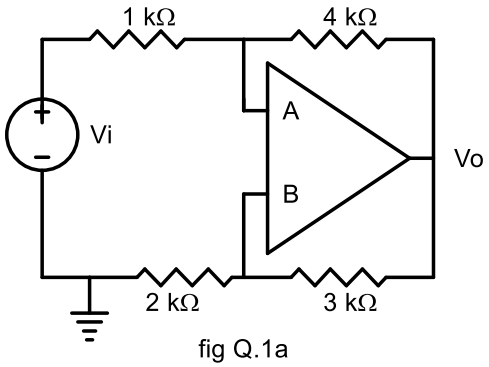

fig Q.1a

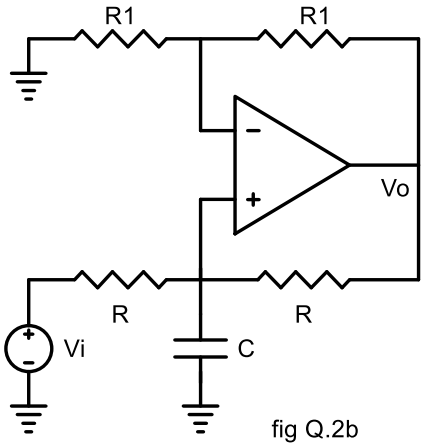

fig Q.2b

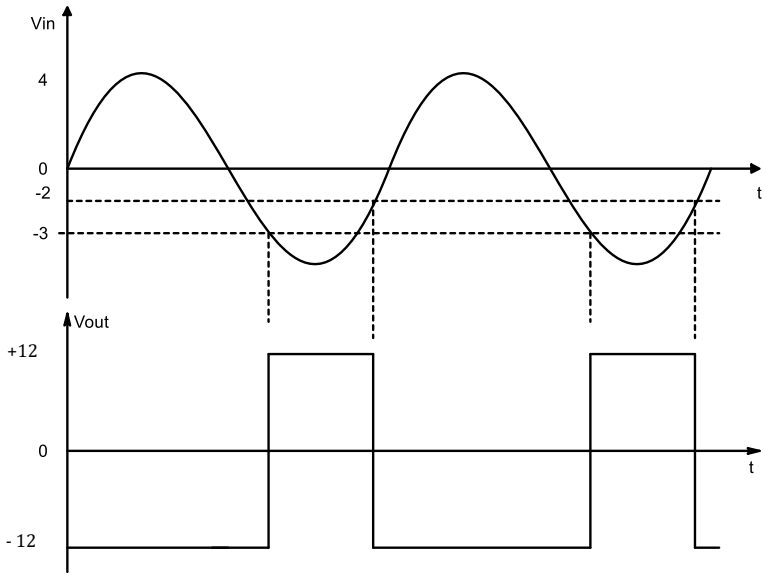

fig Q.3c

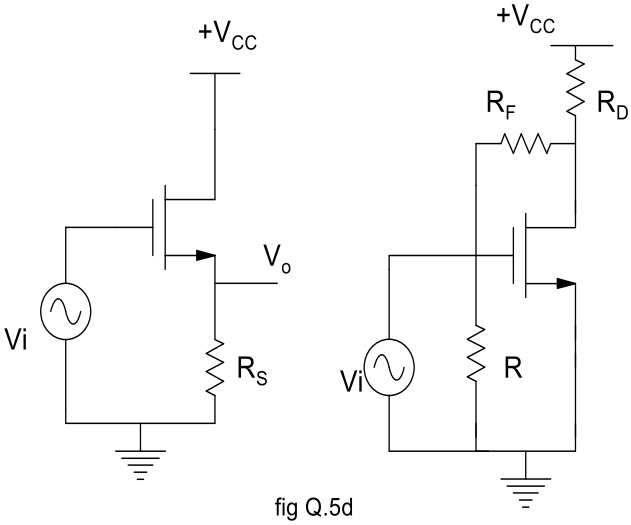

fig Q.5d