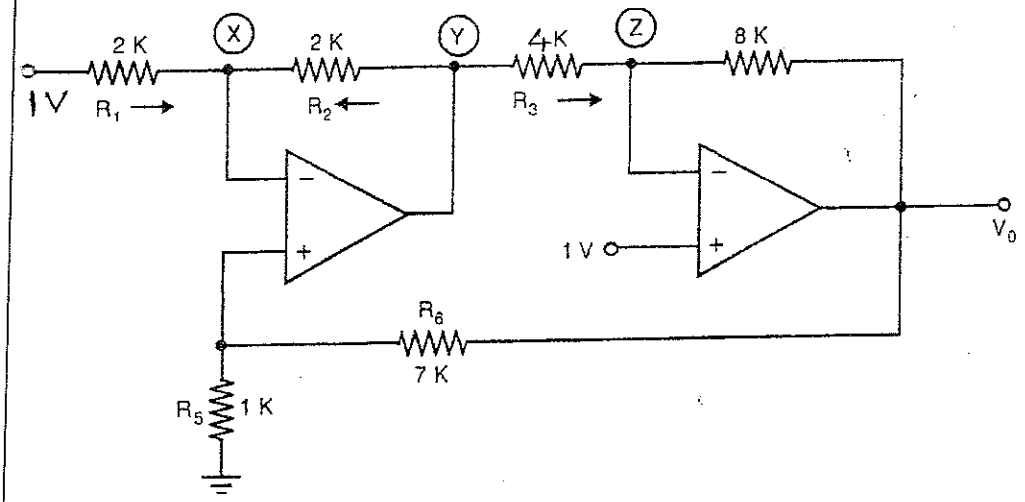
BITS, PILANI – DUBAI CAMPUS	
FIRST SEMESTER 2012 – 2013	
Course Code: EEE C364 / INSTR C364	Date: 8.1.2013
Course Title: Analog Electronics	Max Marks: 70
Duration: 3 Hours (8.30A.M – 11.30A.M)	Weightage: 35%
Component: COMPREHENSIVE EXAM (CLOSED BOOK)	
Note: This question paper contains 7 questions and 4 pages. Answer all Questions. Assume suitable data if required.	

Q1(a) Find the output voltage for the circuit shown in Fig.1.Assume op-amp to be ideal.



[5M]

Fig.1

(b) Determine the value of unknown resistors for the circuit of Fig.2 to produce an output $V_0 = -2V_a - V_b$

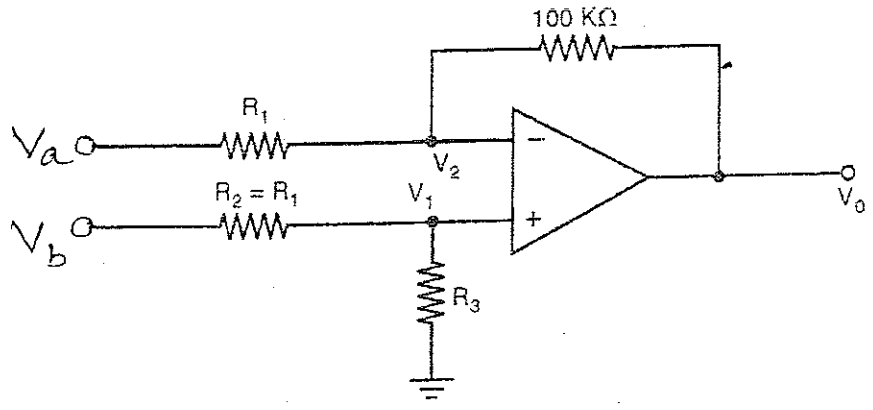
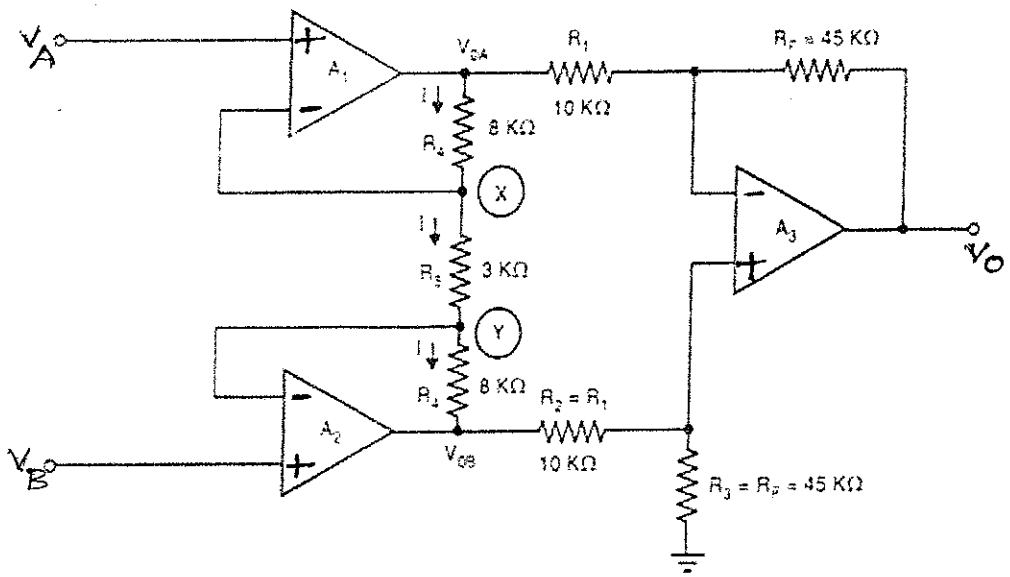


Fig.2

[5M]

Q2(a)	In a certain power amplifier circuit ,the output current $i_c = G_1\, i_b + G_2\, i_b^2$ for an input signal is given by $i_b = (I_1 \cos\omega_1 t + I_2 \cos\omega_2 t)$. where G_1, G_2, I_1 and I_2 are constants. Show that the output will contain a DC term and sinusoidal terms of frequencies $\omega_1, \omega_2, 2\omega_1, 2\omega_2, (\omega_1 + \omega_2)$ and $(\omega_1 - \omega_2)$.	[5M]
(b)	A sinusoidal voltage of peak value 5mV and frequency of 1KHZ is applied to the input of differentiator circuit. Find out the output voltage if R_f = 56KΩ and C =1μF. Also draw the input and output waveforms.	[5M]
Q3(a)	What application does the circuit shown in Fig.3 have? For the circuit shown in Fig.3, determine V_{OA}, V_{OB} and V_o if V_A =3mV and V_B=5mV.  Fig.3	[6M]
(b)	Design an op-amp based wide band-pass filter using high pass and low-pass sections. Consider f_L = 318.3HZ and f_H = 397.9Hz and overall pass band gain of 4. Assume C=0.05μf for first order high pass section and C=0.02μF for first order low pass section. Draw the complete circuit diagram.	[4M]

Q4(a)	Design a Schmitt trigger circuit to produce a hysteresis voltage of 4V.Take $\pm V_{sat} = \pm 13$ V. Assume the resistance connected to pin 3 and pin6 as 10kΩ.	[3M]
4(b)	Differentiate between op amp based basic comparator and Schmitt trigger. Write only key points in your answer	[3M]
4(C)	Find out the transfer function for the circuit shown in Fig.4	

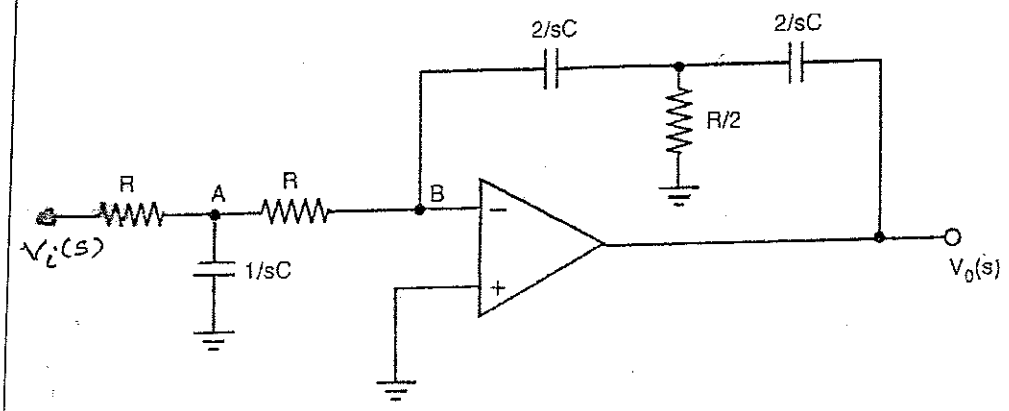


Fig.4 [4M]

Q5(a)	Identify the following circuit shown in Fig.5 and analyze its output voltage When $V_i > 0$ V and when $V_i < 0$ V. Draw a simplified circuit diagram for the above cases. Assuming the input as 1Vp-p and $R_f=R_1$, Sketch the input and output waveforms. Assume diodes are ideal.	

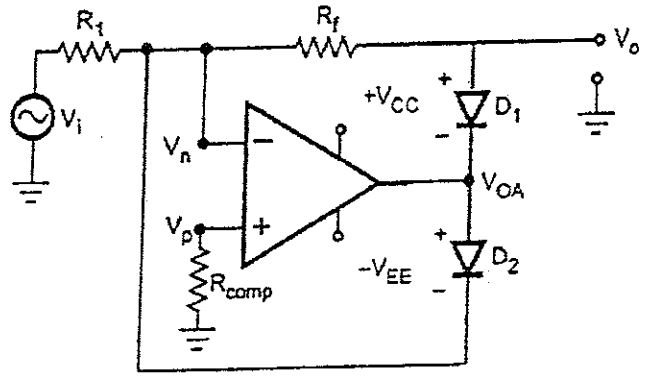
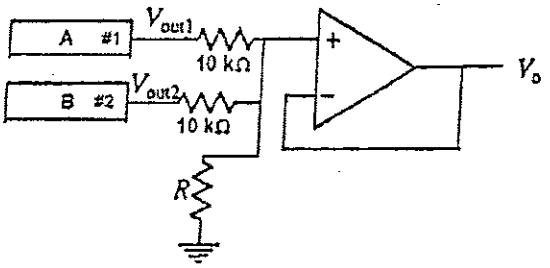
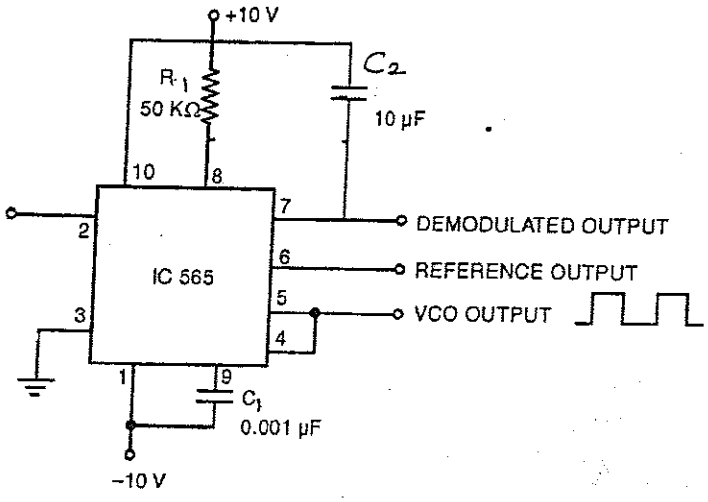


Fig.5 [5M]

(b)	Draw a schematic of an op amp based RC phase shift oscillator. The phase shifting network is made of 3 identical RC sections. The op amp has a maximum input bias current of Ib = 50nA.Assume that a maximum current through the feedback resistor R_f is equal to $100I_b$ and the supply voltage for the op amp is ± 12 V. Design the oscillator circuit for an output frequency of 4KHZ. Determine all component values required.	[5M]

Q6(a)	Two IC temperature sensors A and B deliver outputs 12 mV/°C and 14mV/°C respectively. The outputs of these sensors are used as inputs to a non-inverting OP-AMP as shown in Fig.6. The resistor R is of unknown value. When the room temperature is 30°C the output V_o reads 20mV. Determine the value of R.	[5M]
	 Fig.6	
(b)	Design a timer circuit using IC555 that operates with 5V supply and turns on an LED for duration of approximately 10ms every time it receives a negative trigger pulse. The LED requires about 20mA of operating current and forward voltage drop of 0.7V. The high output of timer is 3.4V.Use C = 0.22μFand filter capacitor as 0.01μF.	[5M]
Q7(a)	Calculate free running frequency, lock range and capture range for the PLL circuit shown in Fig. 7.Also plot the relationship between f_0, Δf_L and Δf_C.	[5M]
	 Fig.7	
(b)	Design the circuit diagram of IC 723 based voltage regulator to give an output of +10V with a maximum load current of 100mA. Assume C=100pF,R_2((connected between pin 4 & ground)= 10kΩ and V_{ref}=7V	[5M]

BITS PILANI DUBAI CAMPUS

EEE/INSTR C364 ANALOG ELECTRONICS - Test 2

Sem1, 20112 - 13 OPEN BOOK Time Allowed: 50 mins

Total Marks : 30 Weightage: 15%

INSTRUCTIONS

This paper contains **FIVE (5)** questions and 2 pages. Answer **ALL** questions. Assume suitable data if required. Semi log graph sheet is provided along with question paper.

1. For the circuit shown in Fig.1, determine the lower cut-off frequency and then plot the frequency response of the filter by expressing gain in decibels. Comment on the order of the filter from the frequency response. [10M]

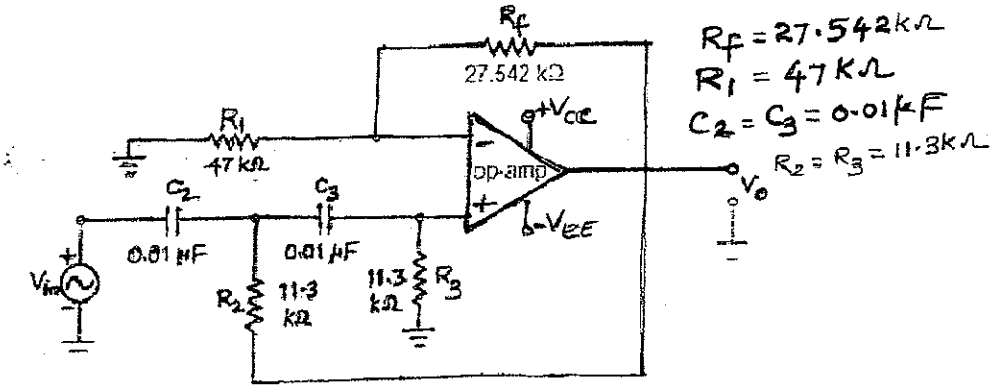


Fig.1

2. Draw the circuit diagram of IC 555 timer used as an astable mode to generate square wave of 1KHZ frequency, giving output equal to 5 V for 0.5msec and output equal to 0 V for next 0.5msec. Connect one red LED and one green LED so that for 0.5 msec red LED is ON and green is OFF and for next 0.5msec green LED is ON and red is OFF. LEDs (Light Emitting Diode) have ratings of 5V and 50mA. Design the circuit for the above specifications. Assume Vcc=5V and V_{LED} =0.7V and C = 0.2μF. [7M].

3. A 1V peak triangular waveform is applied to the input of the inverting super diode in Fig.2.Use the voltage transfer characteristics to draw the output voltage waveform. [2M].

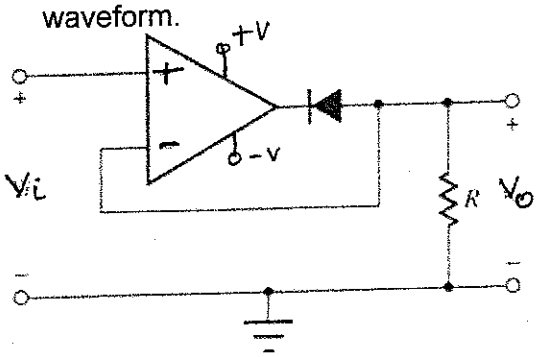


Fig.2

4. A 10V, 2W Zener diode requires a minimum reverse current of 5mA to keep the diode in breakdown. Assume V_{zk} =10V.The diode is used in a regulator circuit shown in Fig. 3.V_{in} can vary from 15V to 20V.
   (a) The diode is expected to operate under minimum condition when V_{in} is minimum. Design a suitable value of R_s so that the regulator circuit can operate under minimum conditions.
   (b) With R_s designed as in (a) above, if V_{in} increases to 20V, determine the operating point for the zener and the power dissipated in R_s.
   (c) What value of R_s will you choose if the diode operates in its maximum conditions? [7M]

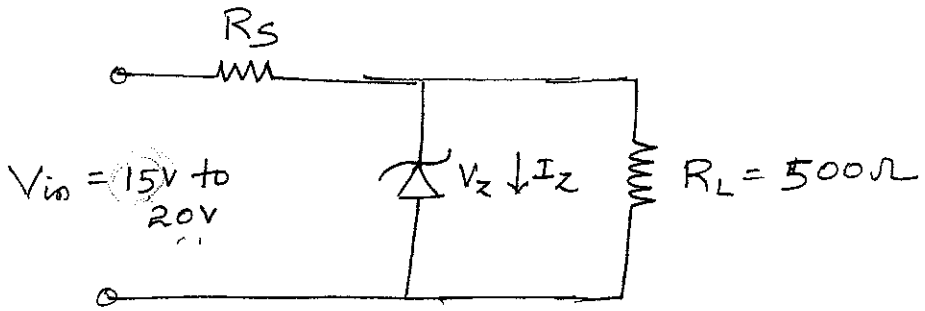


Fig.3

5. Show that the circuit given in Fig.4 will work as an oscillator frequency

$$f = \frac{1}{2\pi RC} \quad \text{if } R_1 = 2R_2$$ [4M]

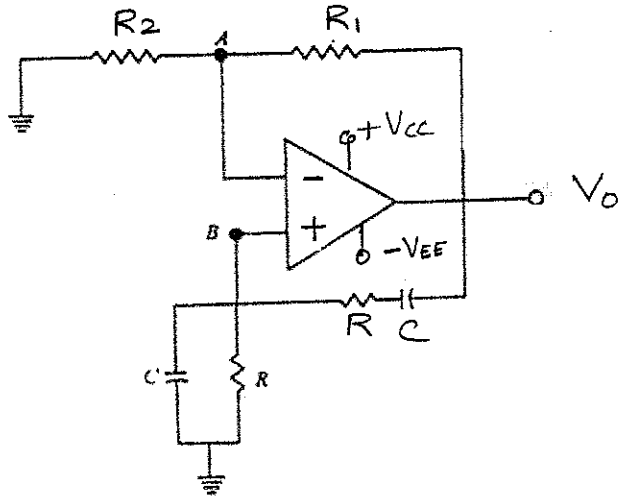


Fig.4

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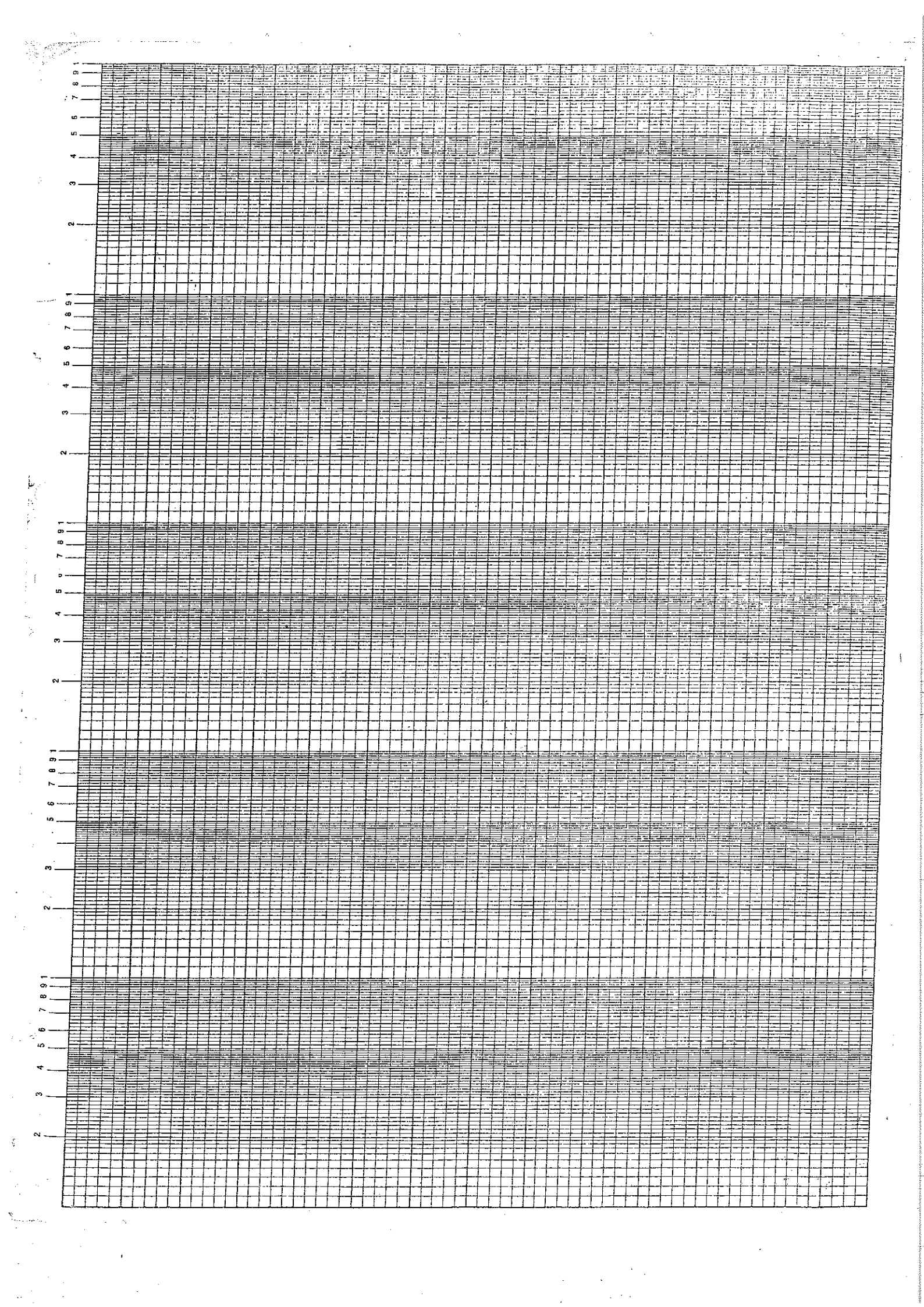


BITS Pilani, Dubai Campus

Dubai International Academic City, Dubai

III year EEE/EIE

First Semester, 2012-2013

TEST-1 (Closed Book)

Course No: EEE /INSTR C364 **Course Title: Analog Electronics**

Date: 21.10.2012 **Weightage:15%** **Duration: 50 minutes** **Max. Marks:30**

Note: Answer the questions in the sequential order. Assume suitable data if required.
This question paper has 6 questions. Answer all questions .

1. A voltage follower circuit employs an opamp which has a slew rate of 10^6V/sec. A symmetrical square wave of peak to peak value **10V** is applied at the input. Sketch the input and output waveform if the frequency of the input is **5KHZ**. Find the peak to peak value of the output. [5M]

2. For the circuit shown in Fig.1, show that $V_o = 2(V_1 - V_2)$.

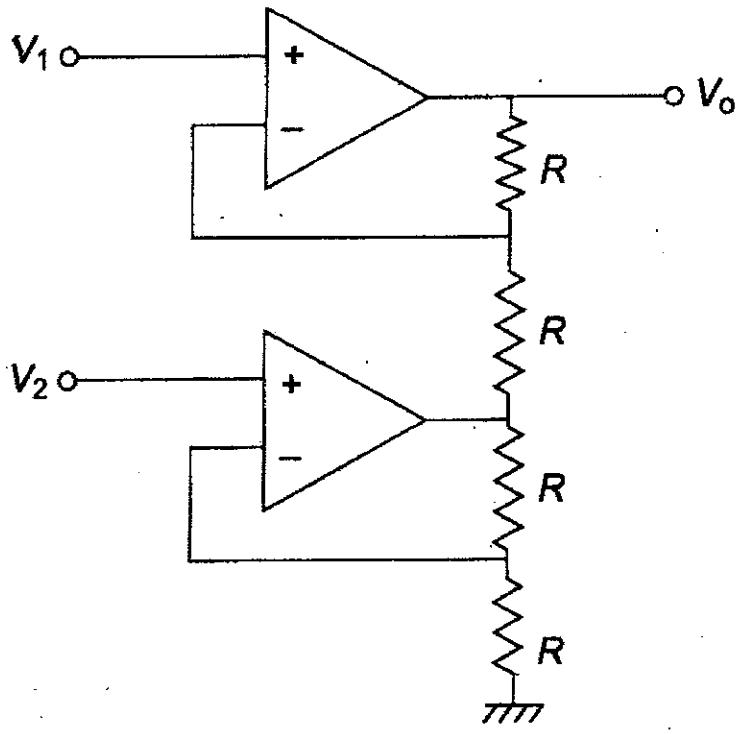


Fig.1 [5M]

P.T.O

3. Design the circuit using two op-amps to get an output

$$V_o = -5V_1 + 2V_2 - 10V_3$$

for three dc inputs V_1, V_2 & V_3 [5M]

4. Sketch the output voltage waveform for the following circuit shown in Fig.2.Assume that the diode is ideal. Given V_{in}= **2 Sin**ωt. Comment on the nature of the output waveform. [5M]

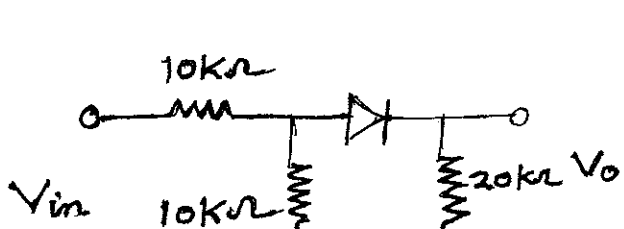


Fig.2

5. An amplifier has open loop gain **A = 60dB** and output impedance Z_o **= 12.6 kΩ**. A negative feedback when provided to this modifies its output impedance to z_{of} **= 500Ω**. Determine the feedback factor. [5M]

6 Design a suitable op-amp based circuits to convert 600μA to 1mA input currents to **4.08** V to **6.8 V** output voltages. [5M]

**************END OF PAPER **********************

BITS, PILANI – DUBAI
FIRST SEMESTER 2012 – 2013

Course Code: EEE C364 Date: 27.11.2012
Course Title: Analog Electronics Max Marks: 10
Duration: 20 minutes Weightage: 5%
Component: QUIZ-2(CLOSED BOOK) **(SET A)**

Note: This question paper contains five (5) questions . Answer all Questions. Assume suitable data if required. You may use reverse side if necessary

1 For the Schmitt trigger circuit shown in Figure 1, Calculate the upper and lower threshold voltage levels. Assume V_{sat}=0.8Vcc and V_{In}= 10Vp-p sinusoid waveform. Also sketch the input and output waveforms. What is the purpose of the 0.8kΩ resistor? Why the value is chosen as 0.8kΩ [3M]

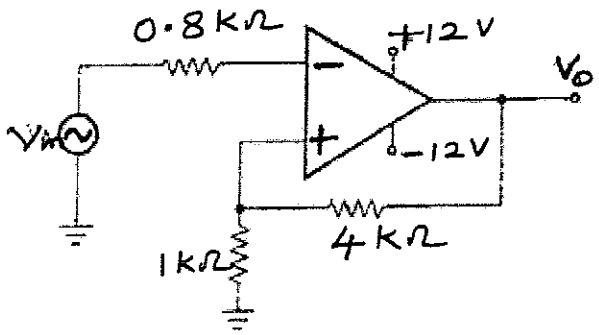


Figure.1

2. Why hysteresis is desirable in a Schmitt trigger? Write only key points in your answer. [1M]

3. Identify the type of the circuit shown in Fig.2 and analyze output voltage v_o for $V_i > 0$ and $V_i < 0$. [2M]

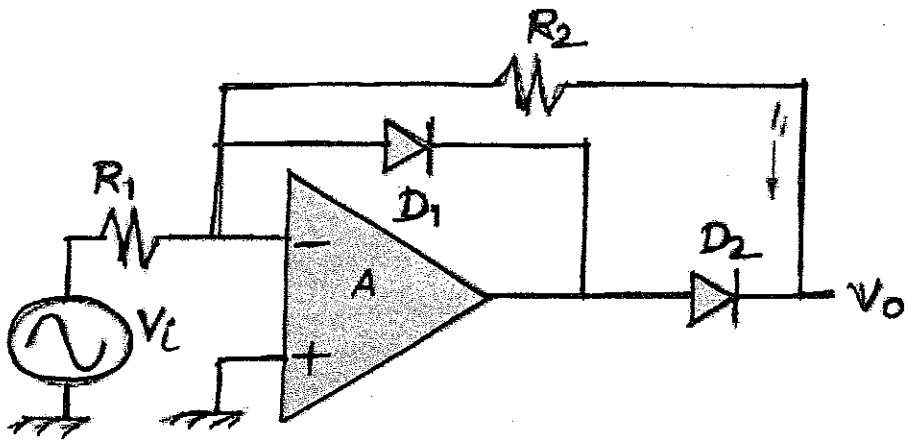
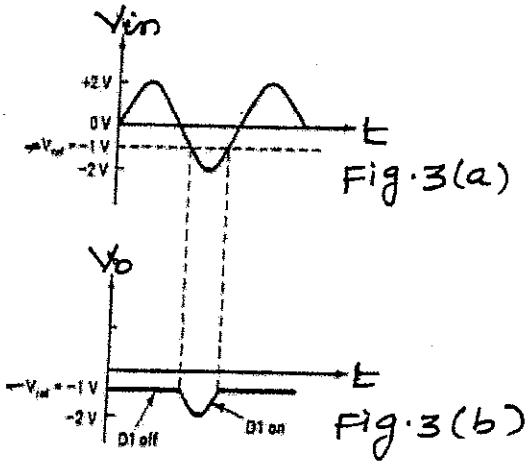


Fig.2

4. Draw a suitable circuit diagram using op-amp such that when input given in Fig.3(a) is applied, it should produce an output given in Fig.3(b). [2M]



5. If $V_i = 4\sin\omega t$ is applied to the input of a squarer circuit and the output passed through a DC blocking capacitor. Draw the output waveform. [2M]

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III year EEE/EIE

First Semester, 2012-2013

QUIZ-1 (Closed Book) SET A

Course No: EEE/INSTR C364 **Course Title: Analog Electronics**

Date: 9.10.2012 **Weightage: 5%** **Duration: 20 minutes** **Max. Marks:10**

(Answer the questions in the sequential order. You may use the reverse side if necessary. This question paper has 6 questions. Answer all questions)

1. Technician "A" says a diode is used to control the direction of current flow. Technician "B" says a diode is used to control a voltage spike across an inductor. Who is correct?

   (A) A only
   (B) B only
   (C) Both A and B
   (D) neither A nor B

   Answer---------- [1M]

2. Which choice below best defines the purpose of a buffer (constructed with an op-amp)?

   (A) To invert the input signal
   (B) To amplify the input signal
   (C) To invert and amplify the input signal
   (D) To isolate the input signal from the rest of the circuit
   (E) To effectively increase the input impedance of the op-amp

   Answer ----------[1M]

3. The important characteristic of emitter-follower is
   (A) high input impedance and high output impedance
   (B) high input impedance and low output impedance
   (C) low input impedance and low output impedance
   (D) low input impedance and high output impedance

   Answer----------[1M]

4. One differential amplifier has CMRR of 200dB and another has CMRR of 50dB. Which differential amplifier you will prefer and why? Write only key points in your answer. [2M]

P.T.O

5. For the circuit shown in Fig.1, find V_o if R_f = 10kΩ, R_1 =2kΩ and R_2 =5 kΩ. Sketch the output voltage waveform if V_1 =2V peak-peak sinusoidal input signal and an ideal op-amp and V_2 =1V peak-peak sinusoidal input signal and an ideal op-amp. Assume supply voltages of op-amp as ± 10V. [2M]

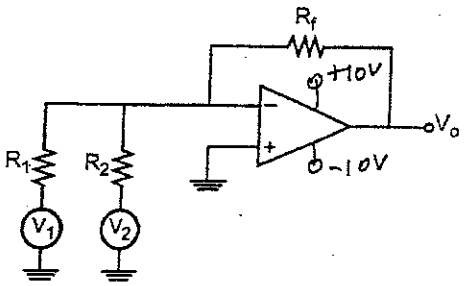

Fig.1

6. Identify the following circuit shown in Fig.2 and determine the output voltage for a step input(dc voltage shown in Fig.3) Also sketch the output voltage for 0≤ t ≤ 5.Assume that the op-amp is initially in null condition. [3M]

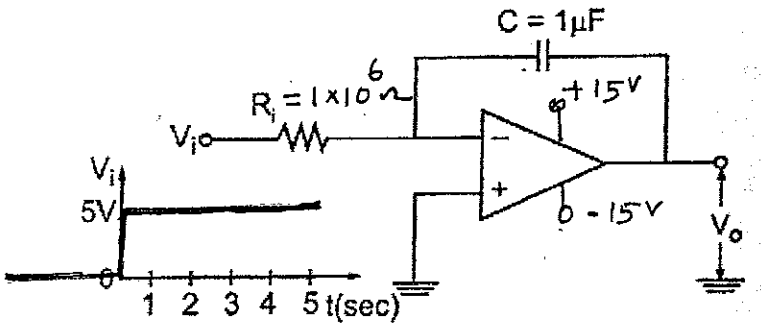

Fig.3 Fig.2

BITS Pilani, Dubai Campus

Dubai International Academic City, Dubai

III year EEE/EIE

First Semester, 2012-2013

QUIZ-1 (Closed Book) SET B

Course No: EEE/INSTR C364 **Course Title: Analog Electronics**

Date: 9.10.2012 **Weightage: 5%** **Duration: 20 minutes** **Max. Marks:10**

(Answer the questions in the sequential order. You may use the reverse side if necessary. This question paper has 6 questions. Answer all questions)

1. Identify the following circuit shown in Fig.1. and determine the output voltage for a step input(dc voltage shown in Fig.2) . Also sketch the output voltage for $0 \leq t \leq 5$. Assume that the op-amp is initially in null condition.

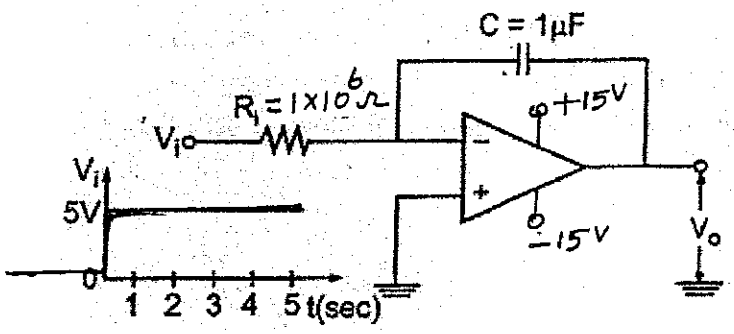

Fig.2 Fig.1 [3M]

2. For the circuit shown in Fig.3, find V_o if R_f = 10kΩ, R_1 =2kΩ and R_2 =5 kΩ. Sketch the output voltage waveform if V_1 = 2V peak-peak sinusoidal input signal and an ideal op-amp and V_2 =1V peak-peak sinusoidal input signal and an ideal op-amp. Assume supply voltages of op-amp as ± 10V. [2M]

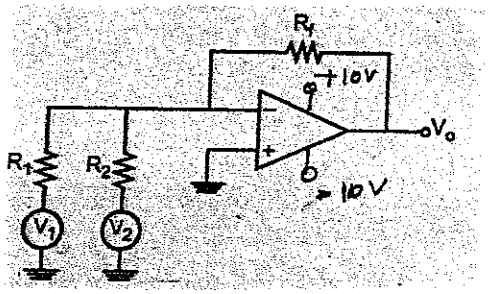

Fig.3

P.T.O

3. Technician "A" says a diode is used to control the direction of current flow. Technician "B" says a diode is used to control a voltage spike across an inductor. Who is correct?

(A) A only
(B) B only
(C) neither A nor B
(D) Both A and B

Answer:---------- [1M]

4. Which choice below best defines the purpose of a buffer (constructed with an op-amp)?

(A) To isolate the input signal from the rest of the circuit
(B) To invert the input signal
(C) To invert and amplify the input signal
(D) To amplify the input signal
(E) To effectively increase the input impedance of the op-amp

Answer ----------[1M]

5. The important characteristic of emitter-follower is
(A) high input impedance and low output impedance
(B) high input impedance and high output impedance
(C) low input impedance and low output impedance
(D) Low input impedance and high output impedance

Answer---------- [1M]

6. One differential amplifier has CMRR of 200dB and another has CMRR of 50dB. Which differential amplifier you will prefer and why? Write only key points in your answer. [2M]