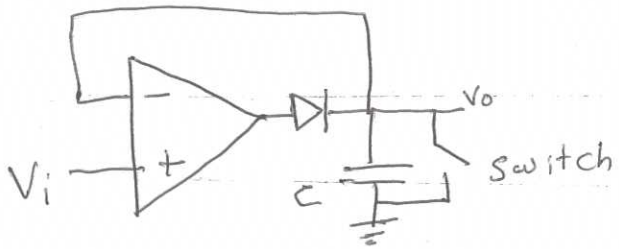
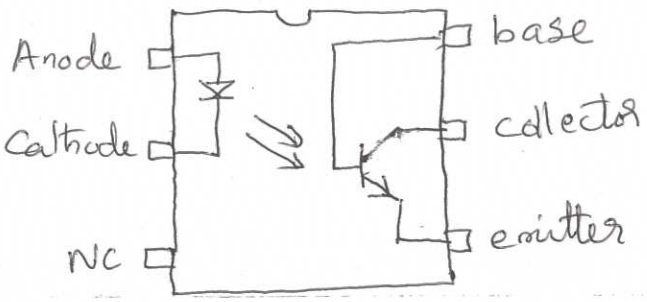
SCHEME OF VALUATION

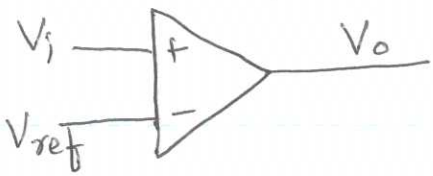
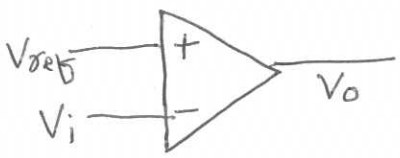
REV: **2015** COURSE TITLE: **Linear Integrated Circuits** COURSE CODE: **4042**

QN NO.	SCORING INDICATOR	SPLIT UP SCORE	SUB TOTAL	TOTAL
I				
1.	Slew rate * is defined as maximum rate of change of output voltage caused by step input voltage	2	2	
2.		2	2	
3	pull-in time is defined as the total time taken by PLL to establish lock	2	2	
4			2	
5)	Astable multivibrator $T = 0.69(R_A + 2R_B)C$ – Assymetrical or $T = 0.69(R_A + R_B)C$ – Symmetrical Monostable multivibrator $T = 1.1RC$	1 1	2	10

SCHEME OF VALUATION
(Scoring Indicators)

Revision : 2015 Course Code: 4042

Course Title: Linear Integrated Circuits

Qst. No.	Scoring Indicator	Split up score	Sub Total	Total
II				
1	openloop gain = ∞ Input impedance = ∞ output impedance = 0 Bandwidth = ∞ zero offset voltage Slew rate = ∞ CMRR = ∞ Input bias current = 0 Input offset current = 0 (Any six)	1x6	6	
2	Two types 1) Non Inverting comparator  $V_i > V_{ref}$ $V_o = +V_{sat}$ $V_i < V_{ref}$ $V_o = -V_{sat}$	3		
	2) Inverting comparator  $V_i > V_{ref}$ $V_o = -V_{sat}$ $V_i < V_{ref}$ $V_o = +V_{sat}$	3	6	

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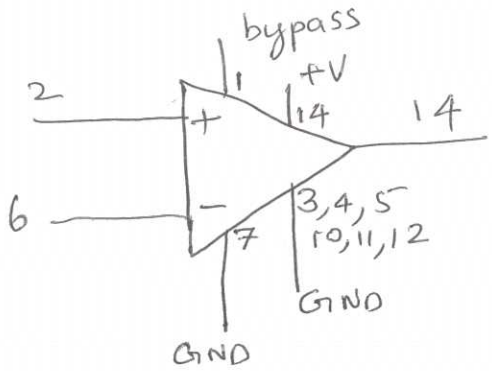
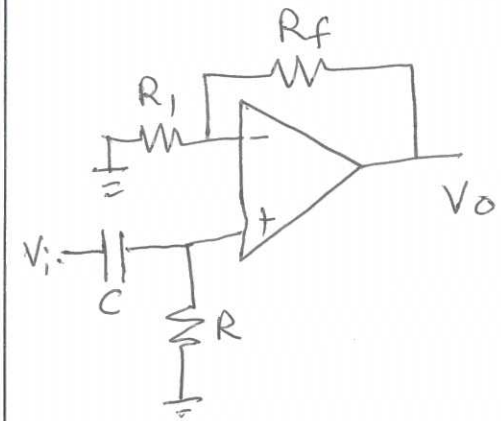
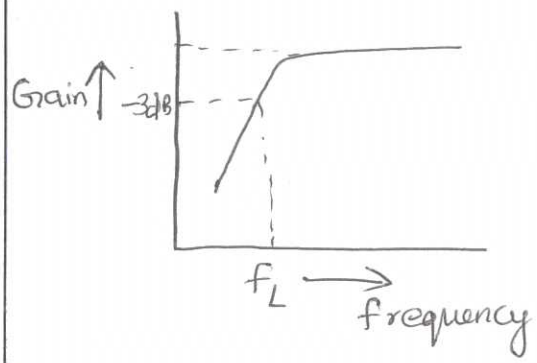
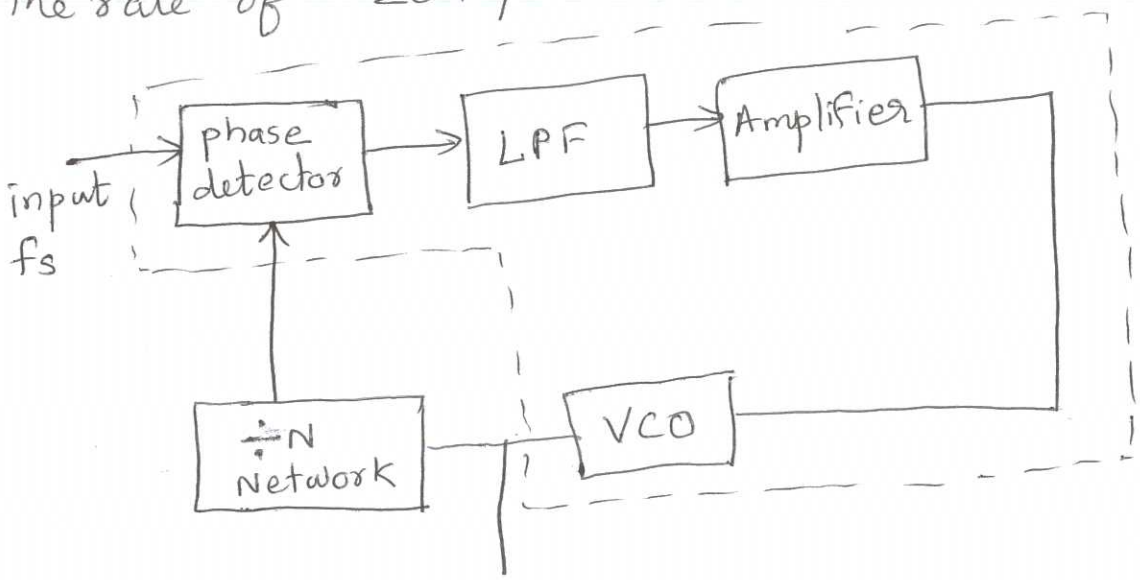
Course Title: Linear Integrated Circuits

Qst. No.	Scoring Indicator	Split up score	Sub Total	Total
3	LM380 It is an audio power amplifier It supply large current to load such as speaker features fixed gain of 50, can be increased to 300 High Impedance Low distortion No need to use seperate heat sink	4		
		2	6	
4	Advantages of SMPS high efficiency small size Light weight Low power dissipation (Any 3)	3		
	Disadvantages of SMPS Greater complexity in circuit Simple design have power factor Costly It can cause harmonic distortion (Any 3)	3	6	

Revision : 2015 Course Code: 4042

Course Title: Linear Integrated Circuits

Qst. No.	Scoring Indicator	Split up score	Sub Total	Total
5		2		
		2		
	It blocks low frequencies Gain = $1+\frac{R_f}{R_1}$ $f_L = \frac{1}{2\pi RC}$. Below f_L gain increases at the rate of 20dB/decade	2	6	
6		4		
	$f_o = Nf_s$ Frequency divider divides the frequency by a factor N. Since divided frequency is in lock with input frequency, VCO is running at the multiple of input frequency	2	6	

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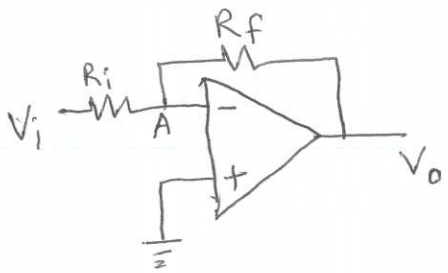
Qst. No.	Scoring Indicator	Split up score	Sub Total	Total
7	LM 723 features 1) Maximum input voltage = 40V 2) output voltage can be adjusted from 2V to 37V 3) It provides upto 150mA o/p current 4) output current can be boosted upto 10A 5) It can be used as a switching or linear regulator 6) both positive and negative voltage can be obtained	1x6	6	
III a)		3		
	Voltage at A, $V_A = 0V$ Applying KVL at A $\frac{V_A - V_i}{R_i} + \frac{V_A - V_o}{R_f} = 0$ $\frac{V_o}{V_i} = -\frac{R_f}{R_i}$	4	7	

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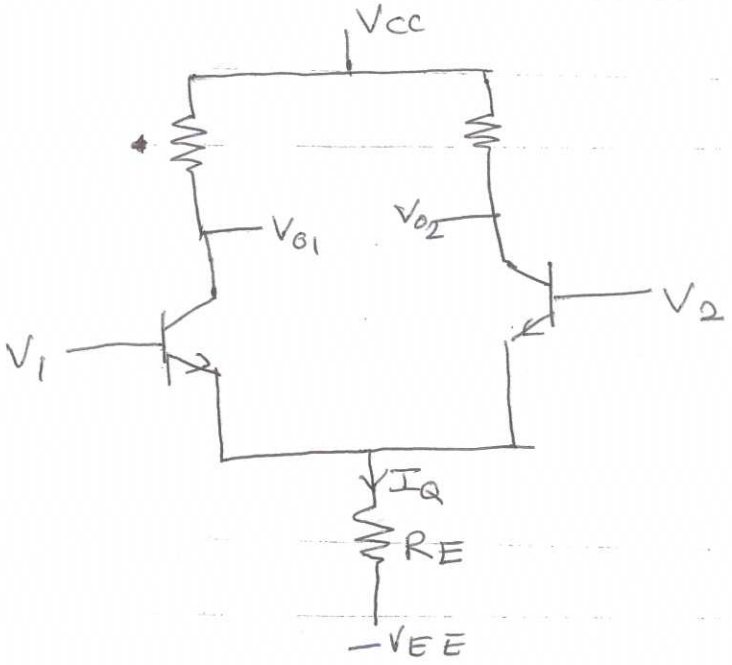
QN NO.	SCORING INDICATOR	SPLIT UP SCORE	SUB TOTAL	TOTAL
III b		4		
	when $V_1 = V_2 = V_{CM}$ (common mode voltage) $V_{o1} = V_{o2} = V_{cc} - \alpha \frac{I_Q}{2} R_c$ Therefore the difference between the collector voltages $V_{o1} - V_{o2} = 0$ V			
	When $V_1 = 1V$ $V_2 = 0V$ transistor Q_1 will conduct Q_2 is OFF $V_{o1} = V_{cc} - \alpha I_Q R_c$ $V_{o2} = V_{ee}$	4	8	15

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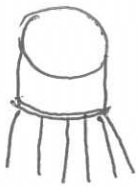
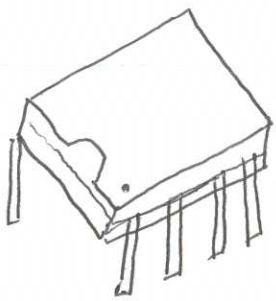
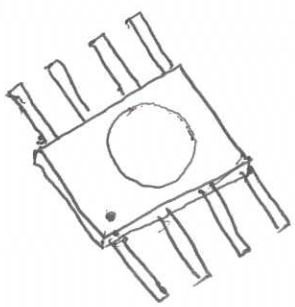
Course Title: Linear Integrated Circuits

Qst. No.	Scoring Indicator	Split up score	Sub Total	Total
IV a)	1) Metal Can package Chip is enclosed in metal case It is good for power amplifiers because of good heat dissipation capability 	2		
	2) Dual in line package (DIP) Chip is mounted inside plastic or ceramic case. 	3		
	3) flat package. Chip is enclosed in rectangular ceramic case 	2	7	

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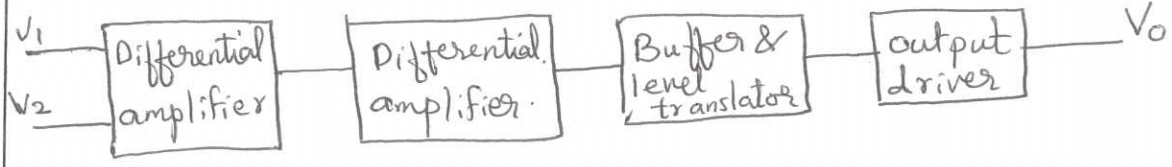
Course Title: Linear Integrated Circuits

Qst. No.	Scoring Indicator	Split up score	Sub Total	Total

b)

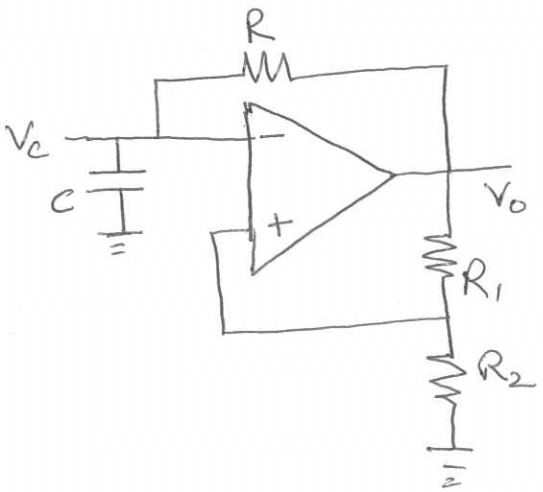


4

Differential amplifier provides high gain and high input impedance. Buffer is an emitter follower circuit whose input impedance is high. Level translator adjust the dc voltage, so that output voltage is zero for zero input voltages. Output driver provides low output impedance and increases the current supplying capability

4 | 8 | 15

V a)



3

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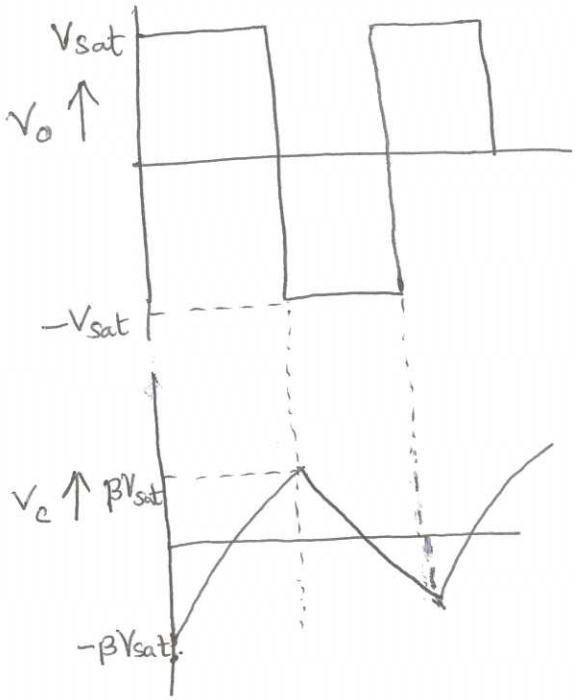
Course Title: Linear Integrated Circuits

Course Code: 4042

Qst. No.	Scoring Indicator	Split up score	Sub Total	Total
		2		
	$\beta = \frac{R_2}{R_1 + R_2}$			
	when output voltage is Vsat capacitor charges towards +Vsat and when voltage across capacitor is just greater than βVsat output switches to −Vsat	3	8	
	Now the capacitor discharges and when the voltage across capacitor reaches just below −βVsat output switches back to +Vsat. This cycle repeats			

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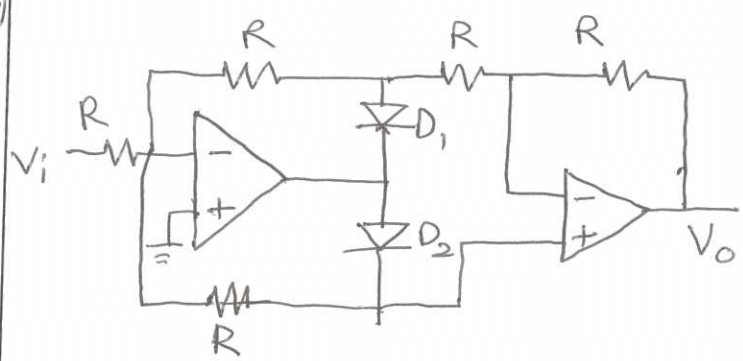
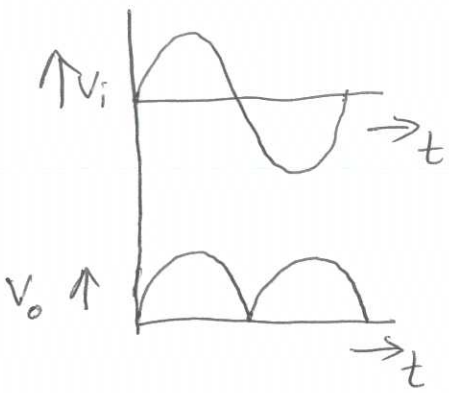
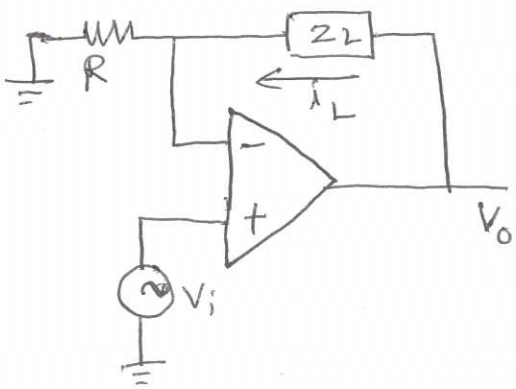
Qst. No.	Scoring Indicator	Split up score	Sub Total	Total
b)		3		
	For positive input voltage D_1 is ON and D_2 is off. $V_o = V_i$	2		
	For negative input voltage D_1 is OFF D_2 is ON $V_o = -V_i$			
		2	7	15
VI 9	V to I converter			
		3		

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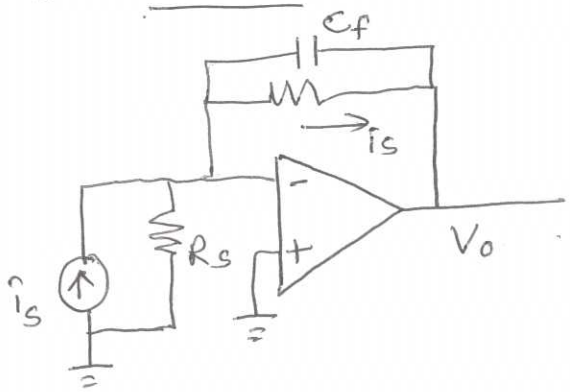
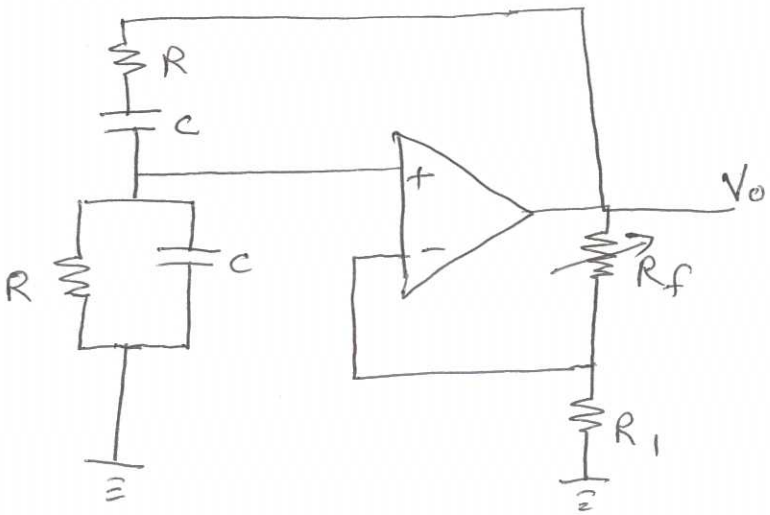
Course Title: Linear Integrated Circuits

Qst. No.	Scoring Indicator	Split up score	Sub Total	Total
	Voltage signal is converted to proportional output current $i_L = \frac{V_i}{R}$	1		
5	I to V Converter 	3		
	Current signal is converted to proportional output voltage. $V_o = -i_s R_f$	1	8	
b)	Wien bridge oscillator 	4		

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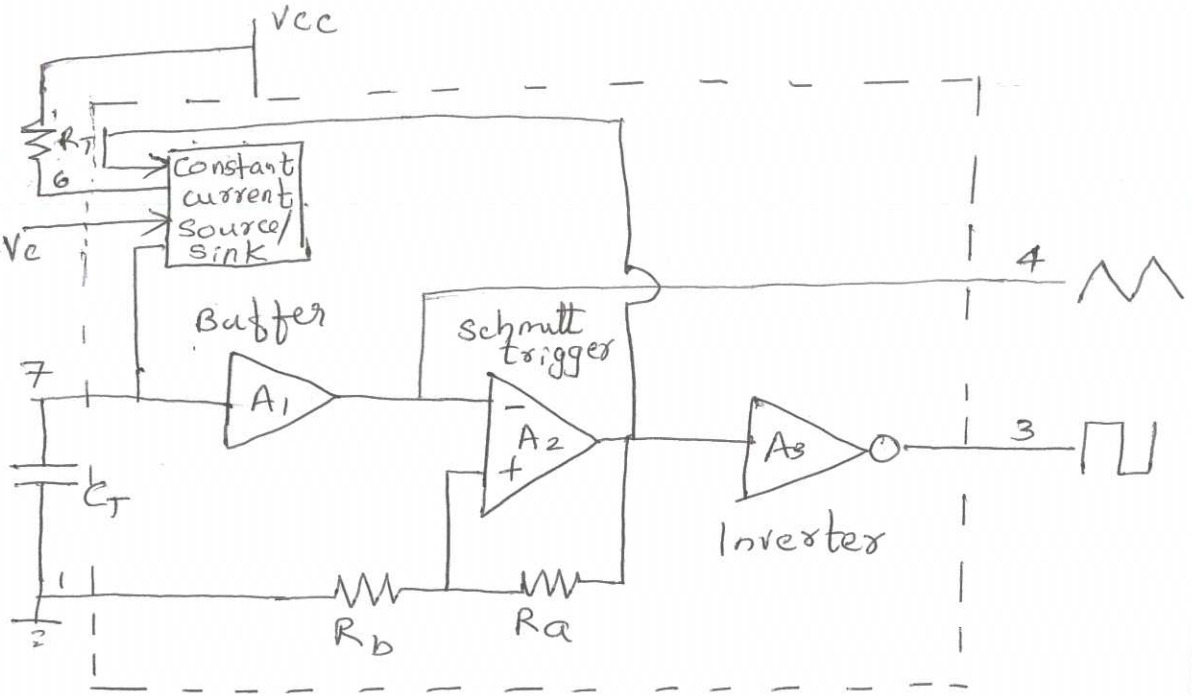
Qst. No.	Scoring Indicator	Split up score	Sub Total	Total
VII a)	Audio frequency oscillator of high stability and simplicity. The feedback signal in this circuit is connected to non inverting input terminal so that op-amp is working as non inverting amplifier. Feedback network neednot provide any phase shift. Frequency of oscillation = $\frac{1}{2\pi RC}$ feedback factor $\beta = \frac{1}{3}$. For sustained oscillation amplifies should have gain of 3	3	7	15
		5		

REV: 2015 COURSE TITLE: **Linear Integrated Circuits** COURSE CODE: 4042

QN NO.	SCORING INDICATOR	SPLIT UP SCORE	SUB TOTAL	TOTAL
	Timing capacitor C_T is charged or discharged by constant current source/ sink. The amount of current can be controlled by changing the voltage, V_C or by changing the timing capacitor, R_T Since source and sink currents are equal capacitor charges and discharges for the same amount of time. This gives triangular wave. The square wave is obtained by using schmitt trigger Inverter is basically a current amplifier to drive the load	5	10	
b)	Features of 555 1) It operates on 5v to 18V 2) It has adjustable duty cycle. 3) Timing is from microsecond to hours 4) It has high current output 5) It can source or sink 200mA 6) output can drive TTL (Any 5)	5	5	15

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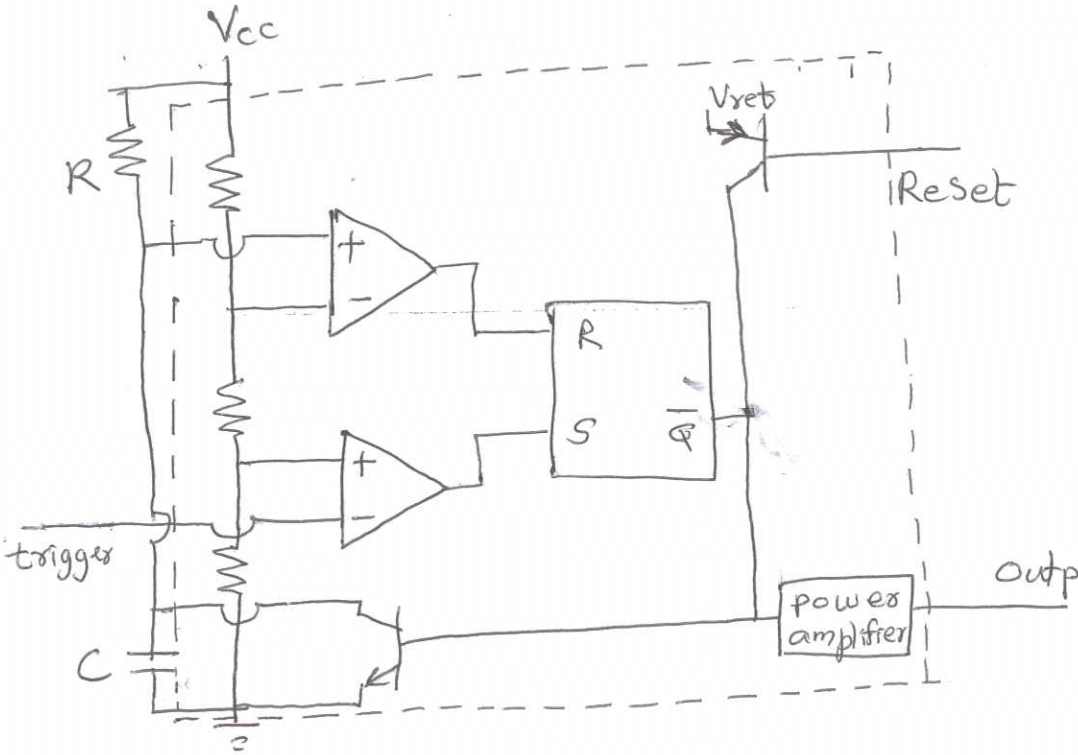
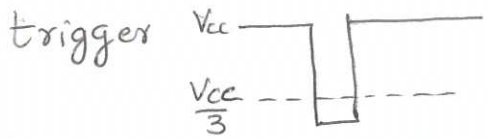
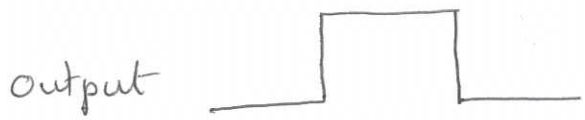
QN NO.	SCORING INDICATOR	SPLIT UP SCORE	SUB TOTAL	TOTAL

VIII a)

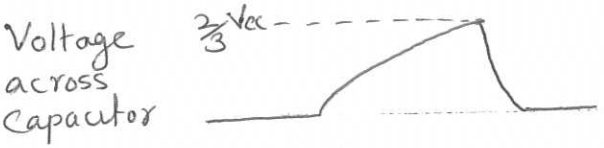


4





2



In stable state output is low
Intially $S = R = 0$, when trigger voltage is less than $\frac{V_{cc}}{3}$ output of lower Comparator becomes high
$S = 1$ $R = 0$ $\overline{Q} = 0$ ie, output is high

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QN NO.	SCORING INDICATOR	SPLIT UP SCORE	SUB TOTAL	TOTAL
	Capacitor charges through resistor R when voltage across capacitor becomes greater than $\frac{2}{3}V_{cc}$. output of the upper comparator becomes high. when S=0 R=1, $\bar{Q}=1$ then output is low	4	10	
b)	Electrical characteristics of PLL			
1)	Operating frequency range 0.001Hz to 500kHz			
2)	operating voltage range ±6V to ±12V			
3)	Input Impedance 10kΩ			
4)	o/p sink current 1mA			
5)	o/p source current 10 mA			
6)	Bandwidth adjustment range <±1% to ±60%			
7)	triangular wave amplitude 2.4Vpp at ±6V			
8)	Square wave amplitude 5.4Vpp at ±6V			
9)	Drift in VCO centre frequency with temperature -300ppm/°C			
10)	Drift in VCO centre frequency with Supply voltage -1.5%/V max	5	5	15
	(Any five)			

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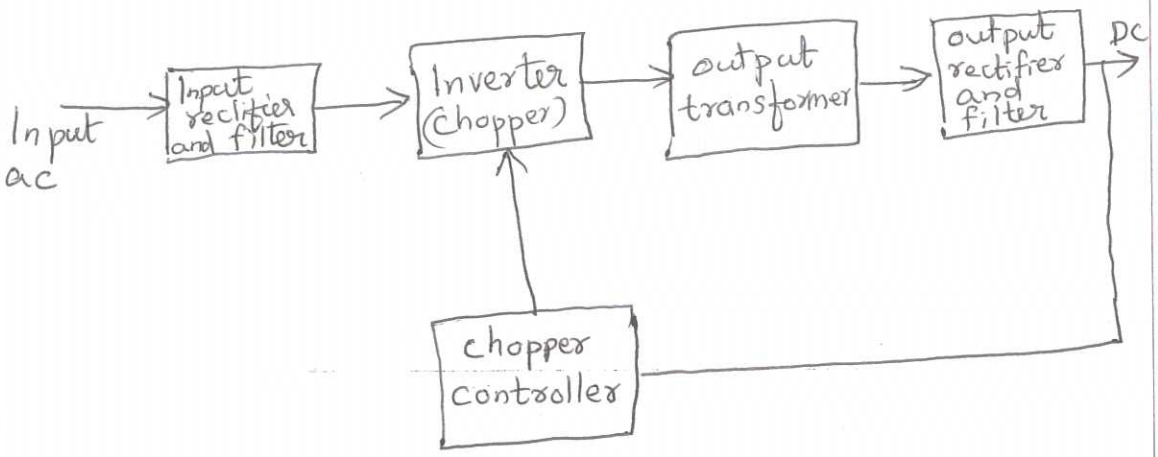
QN NO.	SCORING INDICATOR	SPLIT UP SCORE	SUB TOTAL	TOTAL
IX a)		4		
	Input ac signal is rectified and filtered. The unregulated dc signal is fed to inverter section. It consists of fast switching devices which converts the signal to high frequency pulses (20kHz) output transformer step up or step down the signal to required level The signal is again rectified and filtered to produce required dc voltage	4	8	

SCHEME OF VALUATION

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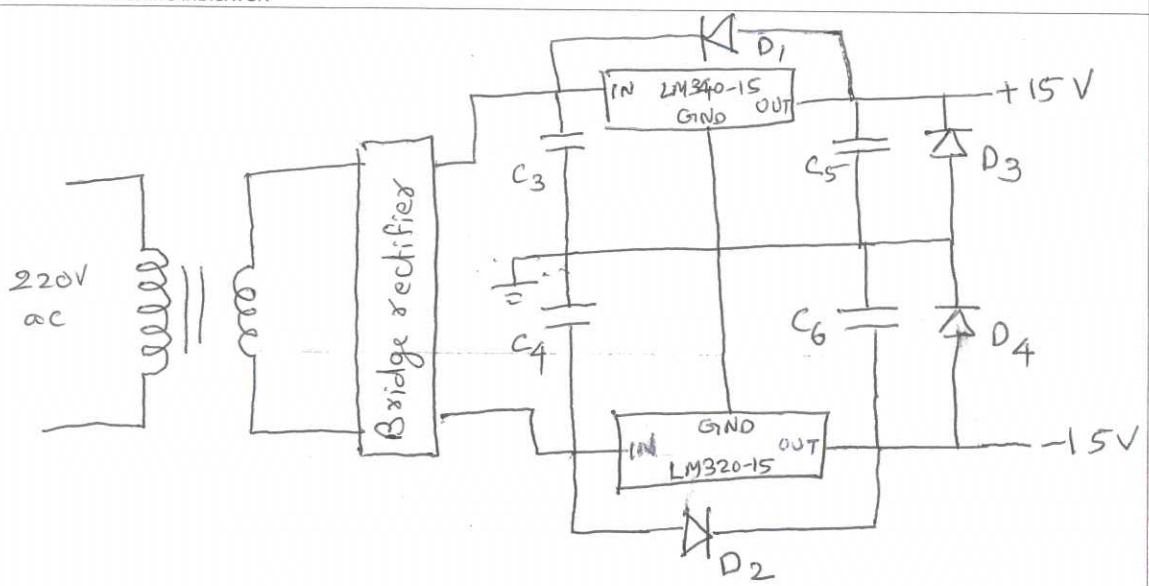
QN NO.	SCORING INDICATOR	SPLIT UP SCORE	SUB TOTAL	TOTAL
b)		4		
	220V ac signal is step down using step down transformer. The signal is then reclified and filtered. LM340-15 is a +15V regulator. LM320-15 is a -15V regulator. Diodes D_1 and D_2 in the circuit protect the regulator against short circuit occuring at its input terminals. Diodes D_3 and D_4 provide protection against the situation when both of the regulators may not turn on simulataneously.	3	7	15

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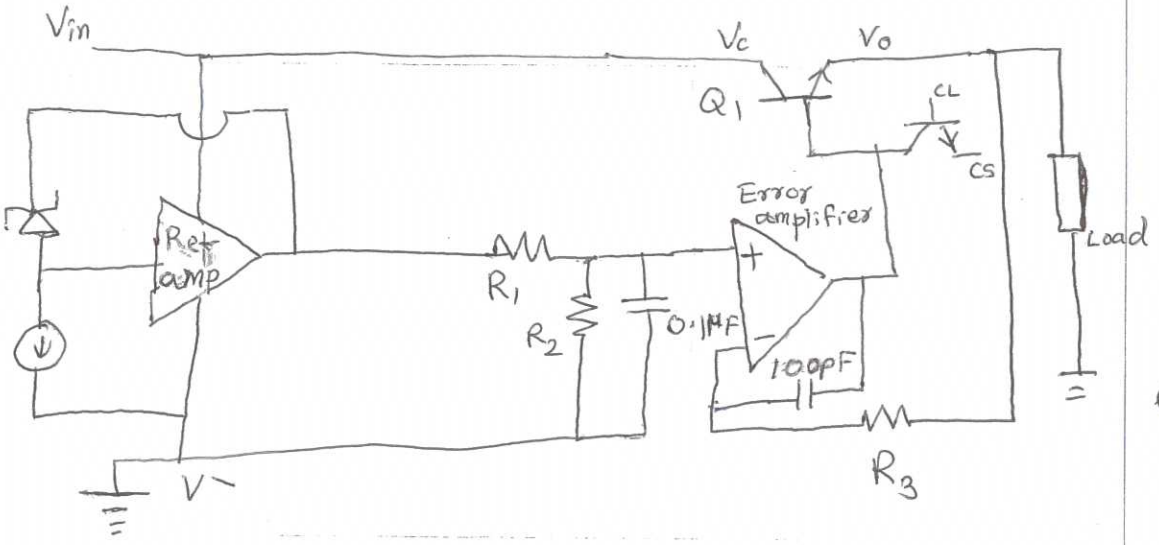
QN NO.	SCORING INDICATOR	SPLIT UP SCORE	SUB TOTAL	TOTAL

X

a) Low voltage regulator using LM723



6

Regulated o/p voltage from 2V to 7V can be obtained

$$V_o = 7.15 \frac{R_2}{R_1 + R_2}$$

$$R_3 = R_1 || R_2$$

Difference between voltage at the non inverting terminal and output voltage is amplified by the error amplifier output of the error amplifier drives the transistor, Q_1. If output goes low Voltage at the inverting terminal becomes less. This makes output of the error amplifier to become more positive. Thus output voltage is increased.

Similarly any increase in load voltage gets regulated

4 | 10

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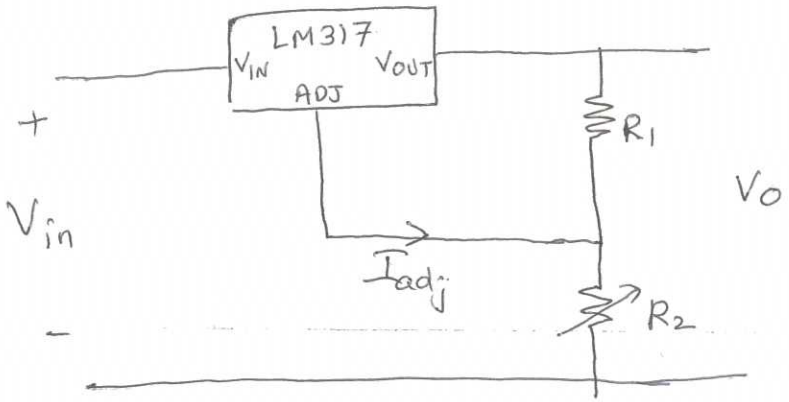
QN NO.	SCORING INDICATOR	SPLIT UP SCORE	SUB TOTAL	TOTAL
b)	LM317			
		3		
	$V_o = V_{REF}\left(1 + \frac{R_2}{R_1}\right) + I_{adj} R_2$			
	· Its output voltage is from 1.25V to 37V	2	5	15
	By varying R_2 output voltage can be varied			