

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 2041

Your Roll No.....

Name of Course : B.Sc. Hons.-(Physics)_NEP: UGCF-202

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Semester : IV- Semester

Name of the Paper: Analog Electronics

Unique Paper Code: 2222012403

Medium of setting the Question paper: English Language

Duration: 2 Hours

Maximum Marks: 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **Four** questions in all. Question No. 1 is compulsory.
3. Simple Non-programmable calculators are allowed.

Q1 Attempt any five parts

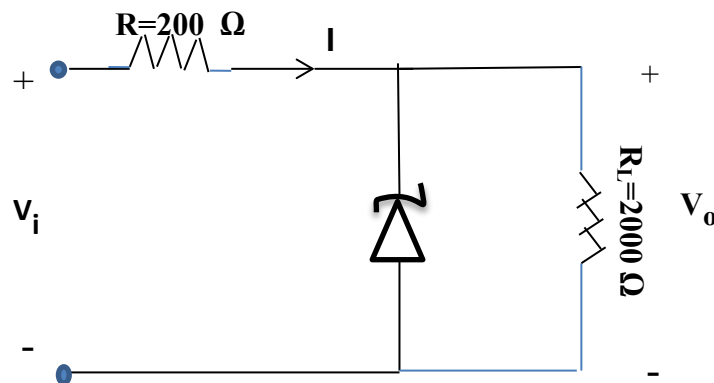
(3x5=15)

- (a) Sketch typical output characteristics curves for a PNP transistor in CB configuration. Label all variables and indicate the active, cut-off and saturation regions of operation.
- (b) What value of a series resistance is required to limit the current through a LED to 20 mA with a forward voltage drop of 1.6V when connected to a 10 V supply.
- (c) What is Barkhausen criterion for sustained oscillations?
- (d) Write equations for h-parameter model of an NPN transistor in CE configuration, and draw its equivalent circuit.
- (e) An Op-Amp has a CMRR value of 55 dB and a differential mode gain of 1200. Find the common mode gain.
- (f) Draw the circuit for the zero-crossing detector using an Op-Amp. Draw the output waveform if the input is a 1kHz sinusoidal waveform and peak value 50 mV.

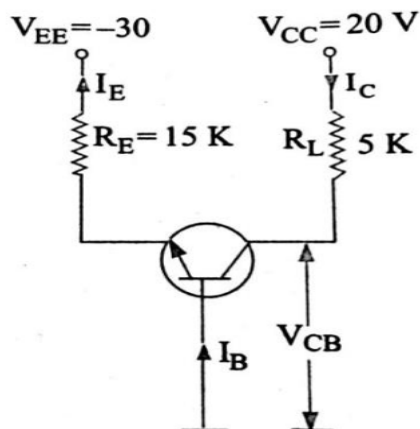
Q-2 (a) Derive the expressions for the r.m.s value of current, ripple factor and rectification efficiency of a Full wave bridge rectifier. Also sketch the output waveform resulting from a sinusoidal input voltage. What is the P.I.V of each diode used in the circuit. (10)

(b) A transistor is connected in common emitter (CE) configuration in which V_{cc} is 8V and voltage drop across collector resistance (R_c) is 0.5V and $R_c = 800 \Omega$. If $\alpha = 0.96$ determine (i) Collector- emitter voltage (ii) base current (I_B) (5)

Q-3 (a) Over what range of input voltage will the Zener circuit shown below will maintain 30 V across $R_L = 2000 \Omega$, assuming that series resistance $R = 200 \Omega$ and Zener current rating is 25 mA. (5)



(b) For the circuit given below, find (i) I_B (ii) I_C (iii) I_E and (iv) V_{CE} . Neglect V_{BE} . (5)



(c) Draw the output waveform corresponding to a sinusoidal input signal of frequency 1 kHz and amplitude 50mV applied to the inverting input of an ideal op-amp. The op-amp is operating in open loop configuration with supply voltages $\pm 15V$. (5)

Q-4 (a) Draw the circuit diagram of a 3 section RC Phase Shift Oscillator, and derive the expression for frequency of the generated oscillations. (10)

(b) Determine the oscillating frequency of a BJT Hartley oscillator, given the component values as $L_1=L_2=4.7mH$, $C_1=600 pF$ and the mutual inductance between L_1 and L_2 is 100 μH . (5)

Q-5 (a) Explain the working of an ideal integrator circuit designed using Op-amp. Explain the problems associated with the ideal circuit and how they are rectified in a practical integrator. Draw the frequency response of the ideal and practical Integrator and mark the region of integration for the practical integration. (10)

(b) In a non-inverting summing amplifier, input voltages $V_1 = 2\text{ V}$ and $V_2 = 4\text{ V}$ are applied through resistors $10\text{k}\Omega$ and $20\text{k}\Omega$ respectively. If $R_f = 30\text{k}\Omega$ and $R_1 = 10\text{k}\Omega$, calculate the output voltage. (5)