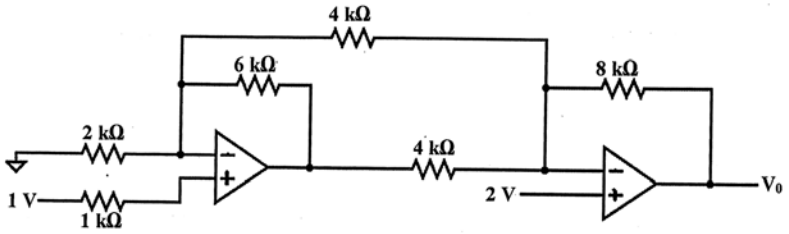
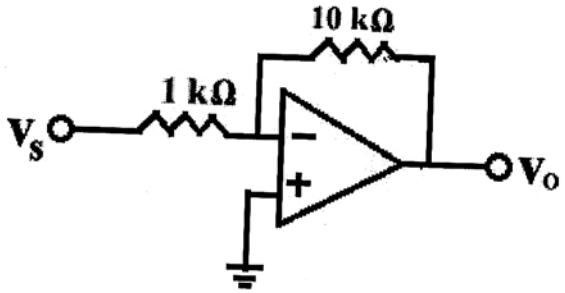
5. a) Find V_0 in circuit shown in figure below.



b) Find the closed loop gain of the inverting op-amp circuit provided below when open loop gain is (i) 100 and (ii) 100000. Give your comment.



5+5

6. a) Write down the rule of op-amp in open loop configuration.

b) Draw the circuit diagram and explain the operating principle of a zero cross detector.

c) Draw circuit diagram of a square wave oscillator.

d) For a 8 bit ADC, reference voltage is 5 V. What will be the output bit pattern if $V_{in} = 4V$. 2+3+2+3

BACHELOR OF SCIENCE EXAMINATION, 2022

(2nd Year, 2nd Semester)

PHSYICS

[ANALOG SYSTEMS AND APPLICATIONS]

PAPER – CORE 10

Time : Two hours Full Marks : 40

Answer *any four* questions.

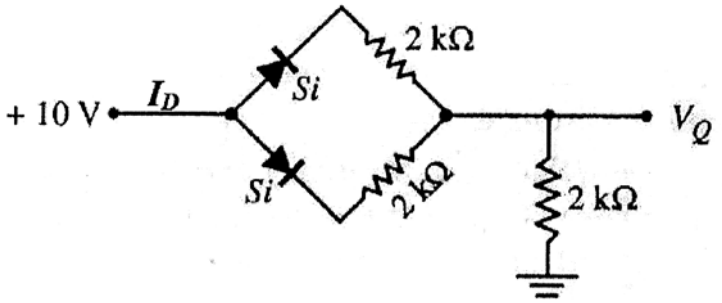
Each question carries equal mark.

1. a) Why the band energy positions of p-type Silicon is higher than n-type Silicon?

b) How the barrier potential depends on junction temperature?

c) Calculate the ripple factor of full wave and half wave rectifier.

d) Find the voltage (V_Q) and current (I_D) in the network shown in the Figure.



2+2+3+3

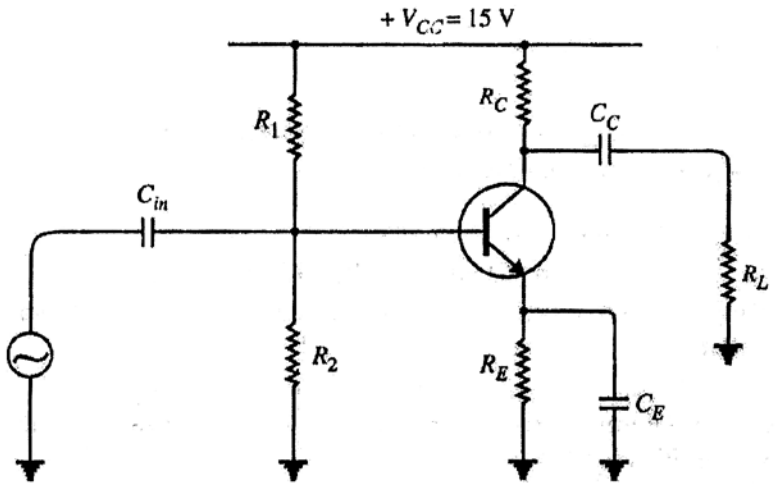
2. a) What is the reason of making base layer thin for a BJT?

   b) Transistor amplifies a signal – does it violate energy conservation principle? Justify your answer.

   c) In Emitter Bias configuration, how stability of biasing is improved compared to Fixed Bias configuration?

   d) For the transistor amplifier shown in the Figure below, $R_1 = 10\ k\Omega$, $R_2 = 5\ k\Omega$, $R_C = 1\ k\Omega$, $R_E = 2\ k\Omega$ and $R_L = 1\ k\Omega$.

   Draw d.c. load and determine the operating point

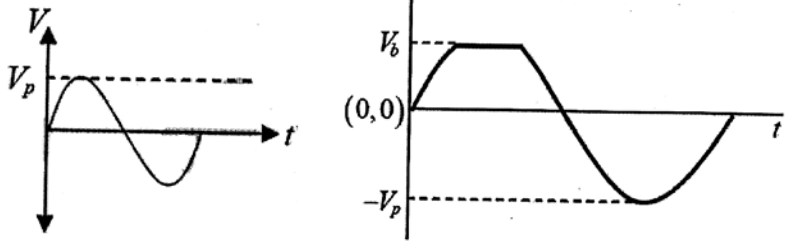


$1\frac{1}{2}+1\frac{1}{2}+3+4$

3. a) Explain the difference in working principle of Light Emitting Diode (LED) and Photodiode?

   b) Design a circuit to get the following output from the given input.

Input **Output**



   c) In Oscillator although there is no supply of continuous ac signal in the input, how will we get the ac signal in the output?

   d) What is Barkhausen criterion for oscillation?

   e) For an oscillator, calculate the resonance frequency of a LC tank circuit. $1\frac{1}{2}+2\frac{1}{2}+2+2+2$

4. a) Draw circuit diagram of a differential amplifier working in common mode configuration. Draw its suitable equivalent r_e model circuit and calculate the gain of circuit.

   b) Explain the virtual ground concept of operational amplifier (op-amp). 7+3