M. Sc. Physics Examination, 2022

M. Sc. Physics (Evening) Examination, 2022

(1st Year, 2nd Semester)

Electronics

Paper – Core 108

Time : Two hours Full Marks : 40

Answer ***any four*** questions.

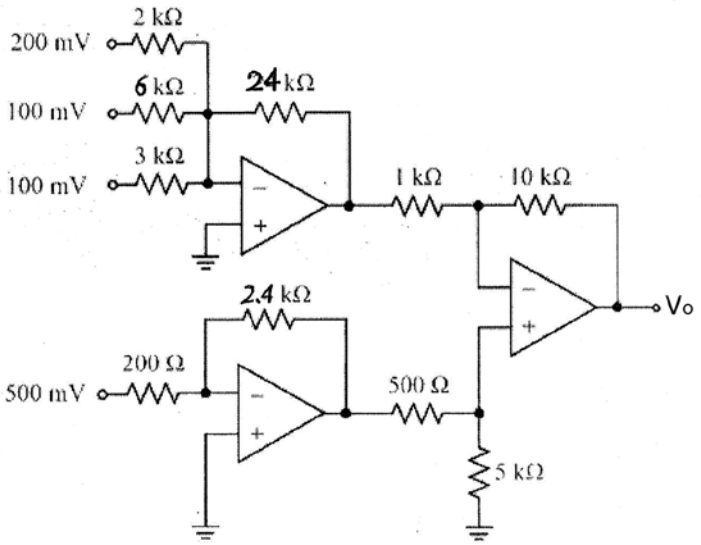
1. What is built in potential across a PN junction? Determine the expression for built in potential of P-N junction diode? What is junction capacitance? How does it vary with the applied bias voltage? 2+3+2+3

2. Write down the working principle of PN junction photodiode. What do you mean by IPCE of a photodetector? Why an intrinsic layer is inserted in PIN photodetector?

   Write down the working principle of a solar cell. What is the power conversion efficiency of a solar cell?

   2+2+2+2+2

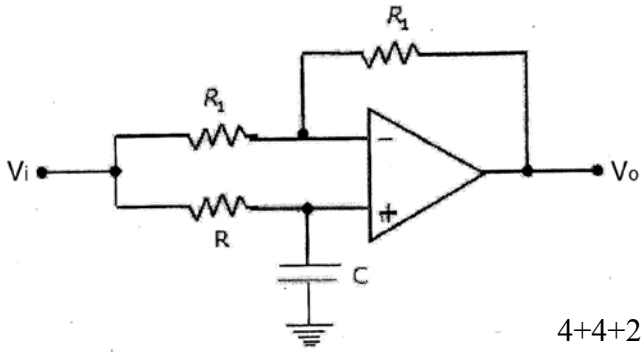
3. a) Find output voltage (v_0) in circuit given in figure below. [Given: $V_{cc} = \pm 30V$]



b) Design a circuit using op-amp to simulate solution of the following simultaneous equations.

$$2x + 3y = 5$$
$$5x - 4y = 1$$

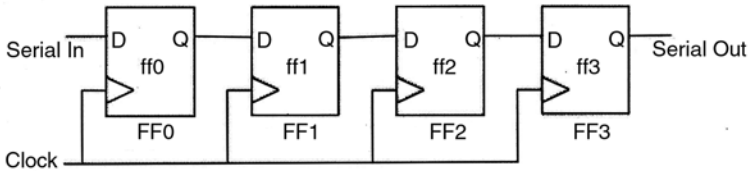
c) Find the transfer function $\left(\frac{V_o}{V_i}\right)$ of the circuit given in figure below.



4+4+2

7 . Describe the operation principle of JK flip flop? What is race around condition for JK FF? How the racing can be avoided?

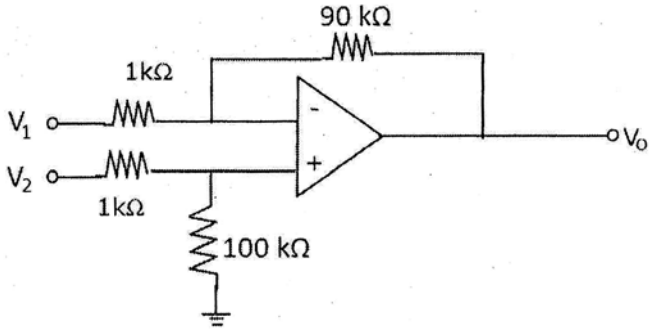
The register shown in figure below has been fed with serial data input 1100. Initially it is cleared to 0000. What will be the output after 4th clock pulse?



4+2+2+2

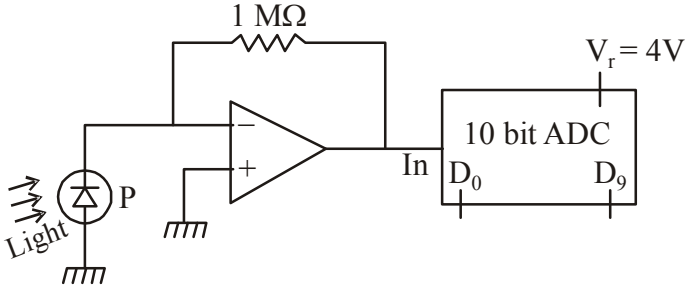
b) Draw the circuit diagram and explain working principle of a Wien bridge oscillator. 5+5

6. a) Find CMRR of the differential amplifier circuit given in figure below.

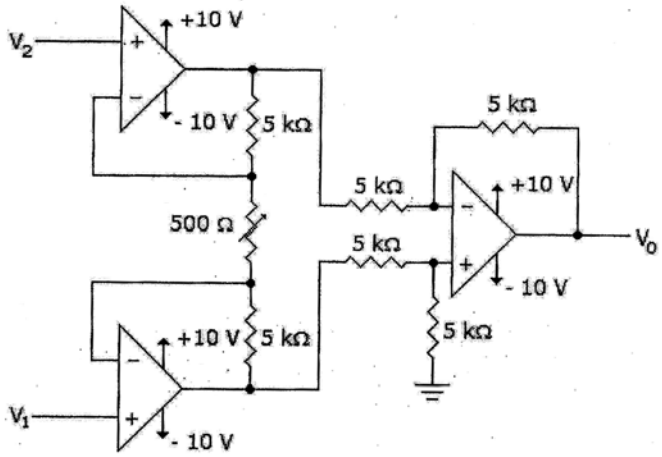


b) Draw the schematic block diagram of an eight bit SAR (successive approximation register) type ADC.

c) The figure below shows a circuit designed to measure the intensity of light. The photo diode P has a responsibility of 0.1 A/Watt of incident light intensity. Determine the range of light intensity that can be measured by this setup. 4+2+4



4. Calculate the output voltage of the instrumentation amplifier circuit given in figure below when $V_1 = 2.5$ V and $V_2 = 2.25$ V.



5. a) In the integrator circuit given in figure below obtain the output voltage when

$$V_i(t) = 1 \text{ for } t < 0$$
$$= 0 \text{ for } t > 0$$