Total Marks : 80   **(3 Hours)**

Note: (1) **Q1 is compulsory**
            (2) Attempt **any three** from the remaining
            (3) Assume suitable data wherever necessary

Q1   **Answer any four from the following**   **20**

a.   An amplifier outputs a voltage that is 10 times the voltage on its input terminals. It
       has an input resistance of $10k\Omega$. A sensor outputs a voltage proportional to
       temperature with a transfer function of $20mV/°C$. The sensor has an output
       resistance of $5k\Omega$. If the temperature is $50°C$, find the amplifier output considering
       the effect of loading.

b.   Draw the absolute value circuit using Op Amp and sketch its input output waveform

c.   Explain the block diagram of a SMPS.

d.   Discuss the different types of filters with their input output characteristics.

e.   Sketch the output of the following circuit:
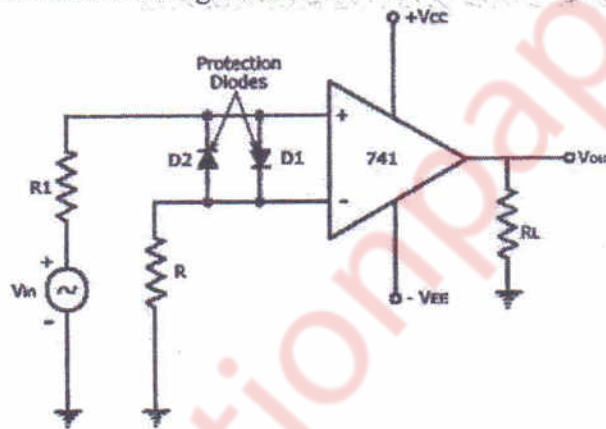
What could be the function of the circuit?

Q2.

a.   Derive the expression for output voltage for an Instrumentation amplifier with a   **10**
       transducer bridge. Also list the applications of the same.

b.   A Solid –state pressure sensor that outputs 25mV/kPa for a pressure variation of 0.0   **10**
       to 25kPa will be used to measure the level of a liquid with a density of
       $1.3*10^3 Kg/m^3$. What voltage output will be expected for level variations from 0 to
       2.0m? What is the sensitivity for level measurement expressed in mV/cm?

Q3.

a. Describe typical R-2R ladder type Digital to Analog converter for 4 bits data. **10** Determine its step size when R_f=20kΩ. Also calculate the output voltage if b0=b1=b2=0 and b3=5V.

b. Explain how Op-Amp can be used as a voltage to current convertor with (a) floating **10** load and (b) grounded load

Q4.

a. What is a RTD? Explain its construction and the signal conditioning circuitry **10** associated with it.

b. Explain monostable multivibrator using IC 555 with neat input output waveforms. **10** Also design a monostable multivibrator to have an output pulse width of 100ms.

Q5.

a. Design a general signal conditioning circuit to convert sensor output i.e. LDR output **10** to 0 volt (Dark) to 5 volt (Light) for resistance range 90KΩ to 5.1KΩ respectively.

b. What is a voltage regulator? What are its types? Design an adjustable voltage **10** regulator using IC 7805 to obtain an output of 12V.

Q6.

a. List the different types of analog to digital convertors. Explain one of them with a **10** neat diagram.

b. What is operating principle of photovoltaic cell. Give its equivalent circuit and **10** hence discuss the signal conditioning circuit associated with it.