



THE FINAL EXAM / 2017-2018
answer 5 questions only

Q1/ (20 marks)

1- Design op amp to solve the differential equation

$$\frac{\partial^2 V_o}{\partial t^2} + 7 \frac{\partial V_o}{\partial t} + \frac{V_o}{9} = V_{in} \cos \omega t$$

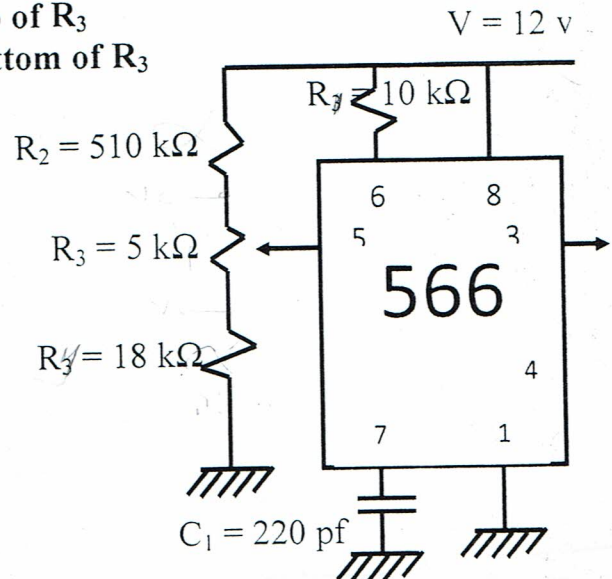
2- Design an op-amp circuit to have an output

$$V_o = \frac{4}{9} V_1 + \frac{51}{63} V_2 + \frac{79}{19} V_3 + \frac{33}{77} V_4$$

Q2 / (20 marks)

The circuit of fig shown. Potentiometer R_3 allow varying V_c from about 9 v to near 12 v . find the control voltage (V_c) and free running frequency (f_0) for the following condition :

- 1- With the potentiometer wiper set at the top of R_3
- 2- With the potentiometer wiper set at the bottom of R_3



Q3/ (20 marks)

Design Remotely controlled LED using a 555 timer

Q4 / (20 marks)

Design a 3rd order unity gain Bessel high pass filter with corner frequency $f_c = 1 \text{ kHz}$. compute each partial filter by specifying the capacitor values and calculating the required resistor values

Filter 1	$a1 = 0.756$	$b1 = 0$	$C1 = 100 \text{ nf}$
Filter 2	$a2 = 0.9996$	$b2 = 0.4772$	$C1 = C2 = 100 \text{ nf}$

Q5 / (20 marks)

For a 5 bit input resistive divider ($0 = 0 \text{ v}$) , ($1 = 10 \text{ v}$) , find :

- 1- The full scal output voltage
 - 2- The output voltage change due to the LSB
 - 3- The analog output voltage for a digital input of 10111.
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Q6 / (20 marks)

Design a 3 bit simultaneous A / D converter

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