

- N.B. :-** (1) Question No. 1 is compulsory.
(2) Attempt any four questions out of the remaining six questions.
(3) Assume suitable data if necessary.

1. Attempt any five :-

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- What are the various regions that a transistor can operate? In which region should be a transistor operated if it is to be used as switch?
- Explain why CE configuration is popular in amplifier circuits.
- Draw and explain the block-diagram of operational amplifier.
- Derive the equation for On-time of the output in monostable multivibrator.
- Write short note on series voltage regulator.
- Derive the equation for transconductance in terms of pinch-off voltage and saturation drain current.
- With the circuit diagram explain voltage-follower and draw input-output waveforms.

2. (a) Draw small-signal h-parameter model of the BJT and define the terms h_{ie} , h_{re} , h_{fe} and h_{oe} for the same. 5
- (b) With approximate analysis, for the amplifier shown in figure 1, calculate the R_p , A_{is} and A_{vs} . The h-parameters of the transistor are : $h_{ie} = 1 \text{ k}\Omega$, $h_{fe} = 50$, $h_{re} = 2.4 \times 10^{-4}$ and $h_{oe} = 25 \times 10^{-6}$. 15

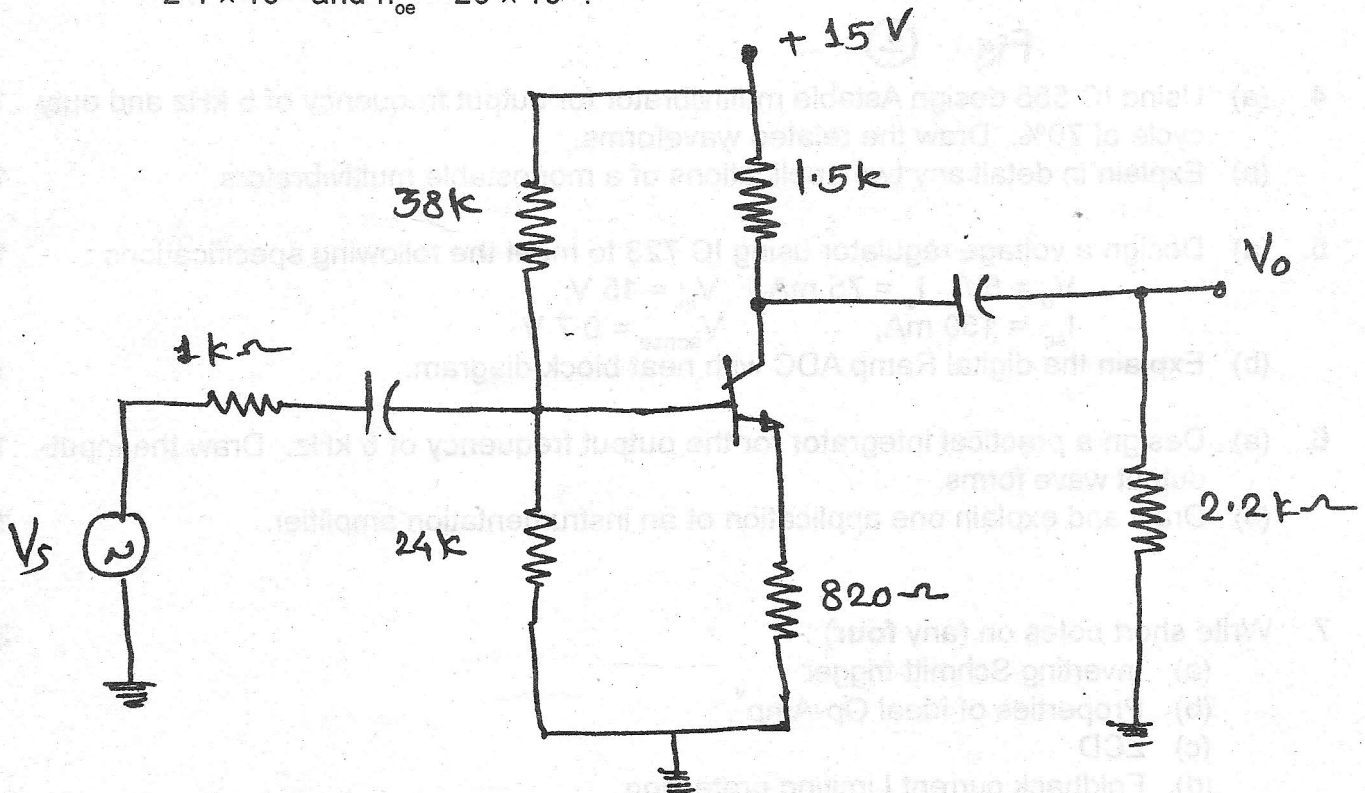
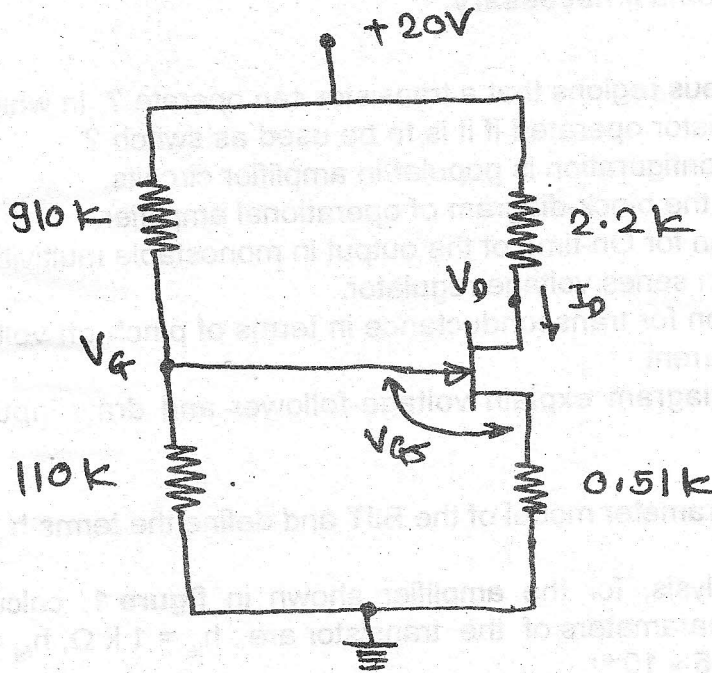


Fig. ①

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3. (a) For n-channel FET $I_{DSS} = 5.8 \text{ mA}$, $V_p = -3 \text{ V}$ and $V_{GS} = -2 \text{ V}$ find I_D , g_m , g_{mo} .
 (b) For the network shown in figure 2 determine I_D , V_{GS} , V_G , V_D , V_S and V_{DS} .

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$I_{DSS} = 10 \text{ mA}$

$V_p = -3.5 \text{ V}$

Fig. ②

4. (a) Using IC 555 design Astable multivibrator for output frequency of 5 kHz and duty cycle of 70%. Draw the related waveforms. 10
 (b) Explain in detail any two applications of a monostable multivibrators. 10
5. (a) Design a voltage regulator using IC 723 to meet the following specifications : 10
 $V_o = 5 \text{ V}$, $I_o = 75 \text{ mA}$, $V_{in} = 15 \text{ V}$,
 $I_{sc} = 150 \text{ mA}$, $V_{sense} = 0.7 \text{ V}$
 (b) Explain the digital Ramp ADC with neat block-diagram. 10
6. (a) Design a practical integrator for the output frequency of 5 kHz. Draw the input-output wave forms. 10
 (b) Draw and explain one application of an instrumentation amplifier. 10
7. Write short notes on (any four) :- 20
 (a) Inverting Schmitt-trigger
 (b) Properties of Ideal Op-Amp.
 (c) ZCD
 (d) Foldback current Limiting protection.
 (e) Small signal amplifiers.