



- KEEPING MOBILE PHONE/ELECTRONIC DEVICES EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer any TEN Questions

(10 X 10 = 100 Marks)

1. In terms of crystal structure, what type of solids are semiconductors? Discuss the formation of energy bands in semiconductors with proper explanation. [10]
2. a) For the circuit shown in Fig.(1a) containing a silicon diode of  $V_f=0.7V$ . [5]  
Determine  $I_R$  and  $V_R$ .

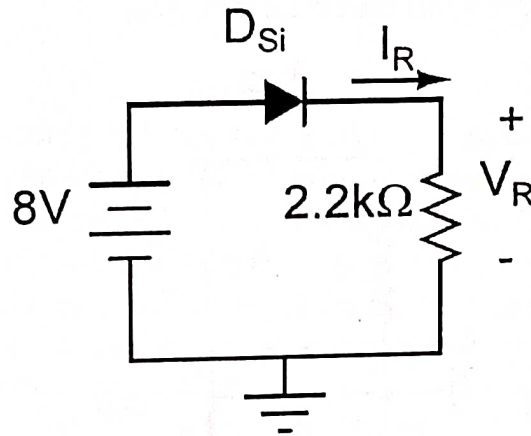


Fig.(1a)

- b) For the circuit shown in Fig.(1b) containing a silicon diode, determine the current through and the voltage drop across the  $2.2k\Omega$  resistor. [5]

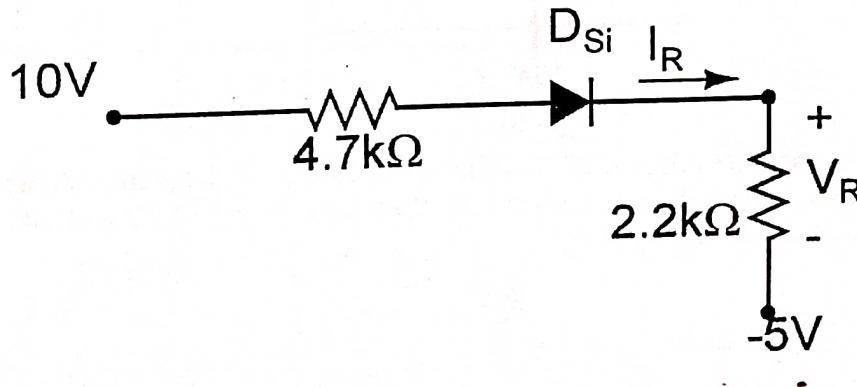


Fig.(1b)

3. a) Consider the circuit shown in Fig.(2a), with  $V_{CC}=2.8V$ ,  $\beta=150$  and  $V_{BE(on)}=0.7V$ . [5]  
Design the circuit such that  $I_{CQ}=0.12mA$  and  $V_{CEQ}=1.4V$ .

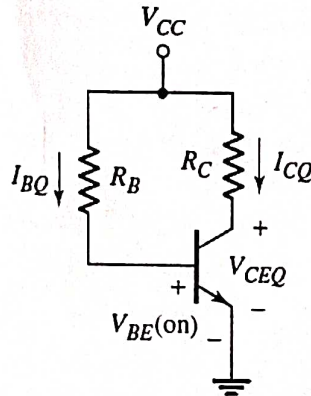


Fig.(2a)

- b) Find the DC quantities  $V_{CEQ}$  and  $I_{CQ}$  if  $R_1=56k\Omega$ ,  $R_2=12.2k\Omega$ ,  $R_C=2k\Omega$ ,  $R_E=400\Omega$ , [5]  
 $V_{CC}=10V$ ,  $V_{BE(on)}=0.7V$  and  $\beta=100$  for the circuit in Fig.(2b).

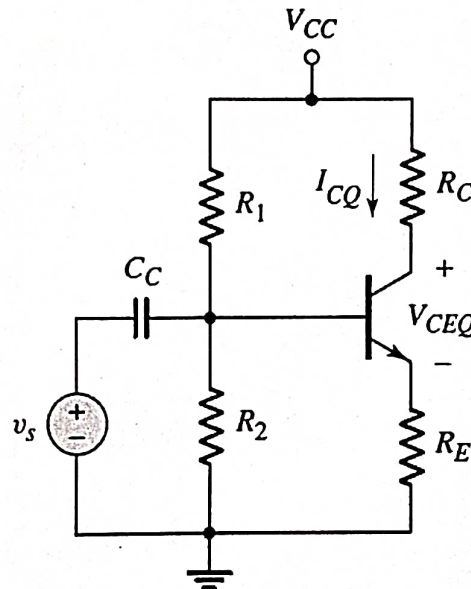


Fig.(2b)

4. Determine the  $V_{GS}$  and  $V_{DS}$  of the MOSFET circuit shown in Fig.(3), if  $I_Q=1mA$ . What [10]  
is the region of operation of the transistor? Take  $K_n=0.5mA/V^2$ ,  $V_{TN}=1.2V$  and  $\lambda=0$ .  
Repeat the calculation when  $I_Q=0.5mA$ .

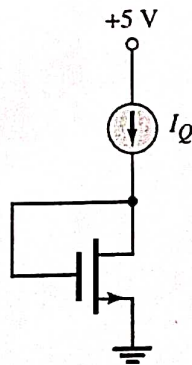


Fig.(3)

5. For the circuit given in Fig.(4), the transistor parameters are  $\beta=100$ ,  $V_{BE(on)}=0.7V$  [10] and  $V_A=\infty$ . Determine  $I_C$ ,  $V_{CE}$  and the voltage gain  $A_v$ .

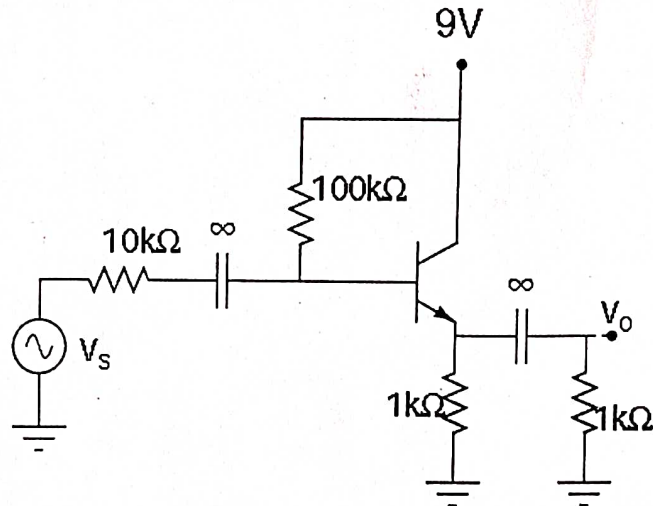


Fig.(4)

6. Draw the circuit of a MOSFET differential amplifier and explain how it works. [10]  
Define its CMRR and suggest how the CMRR can be improved.
7. Draw the block schematic of the voltage series feedback amplifier and derive its gain, input impedance and output impedance. [10]
8. Design the inverting summing amplifier (3-input), non-inverting summing amplifier (3-input) and subtractor. You can use as many 10kΩ resistors as possible apart from the ideal OpAmp in your design. [10]
9. Discuss the operation and working of the Schmitt trigger. [10]
10. Draw the circuit and explain the working of IC555 monostable multivibrator. [10]
11. Draw and explain how successive approximation type ADC works. [10]
12. Fig. (5) has ideal OpAmps. Find the output voltage  $V_{out}$ . [10]

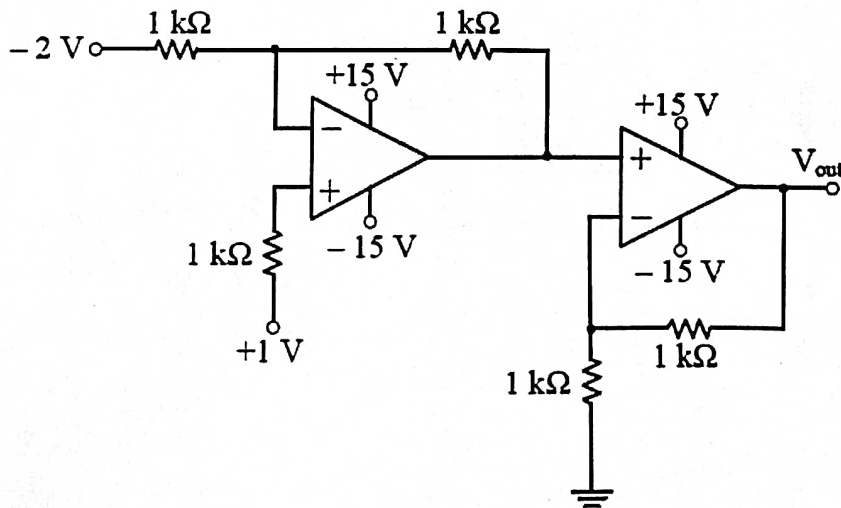


Fig. (5)

⇔⇔⇔ H/E/TX ⇔⇔⇔