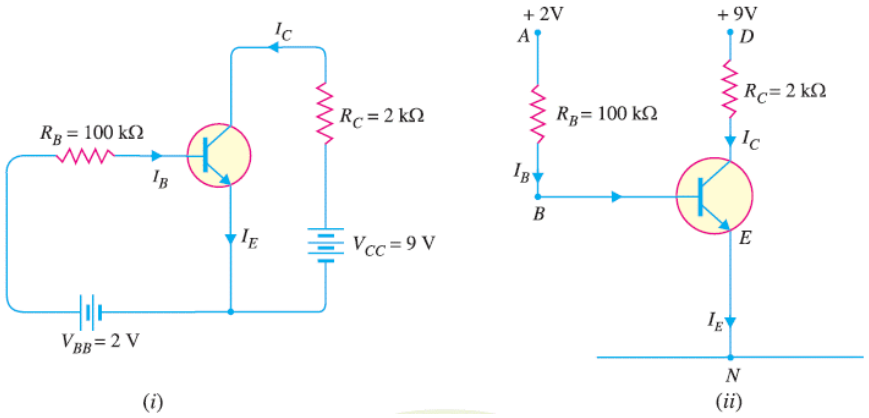
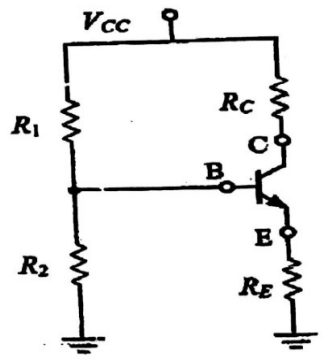
1. With the help of a neat diagram explain the operation of full wave bridge rectifier.
2. A half wave rectifier uses diode with forward resistance of 100 Ω. If the input AC voltage is 220 V (rms) and the load resistance is of 2 KΩ. Determine (i) I_{max}, I_{dc} and I_{rms} (ii) Load output voltage (iii) DC output power and AC input power (iv) ripple factor (v) TUF (vi) Rectification efficiency.
3. A regulator circuit uses zener diode of 30V, series resistance (R_S) is 3KΩ. if the input voltage is 60V, find the zener current (I_Z) when load resistance (R_L) is 20KΩ.
4. Explain the construction of BJT and input/output characteristics of CE configuration.
5. What is Q point? Derive equations for Self-Bias configuration of the transistor.
6. Following figure (i) shows biasing with base resistor method.
7. Determine the collector current I_C and collector-emitter voltage V_{CE} . Neglect small base-emitter voltage. Given that β = 50.

   If R_B in this circuit is changed to 50 kΩ, find the new operating point.



8. **Derive the mathematical relation between current gains α and β of a BJT. Also discuss the leakage currents I_{CBO} and I_{CEO}.**

9. **Consider the following voltage divider bias circuit of BJT. Determine the collector current I_C and collector to emitter voltage V_{CE}. Given, R_1 = 60 kΩ, R_2 = 7 kΩ, R_C = 12 kΩ, R_E = 1.7 kΩ, V_{BE} = 0.7 V, current gain β = 50 and V_{CC} = 30 V.**



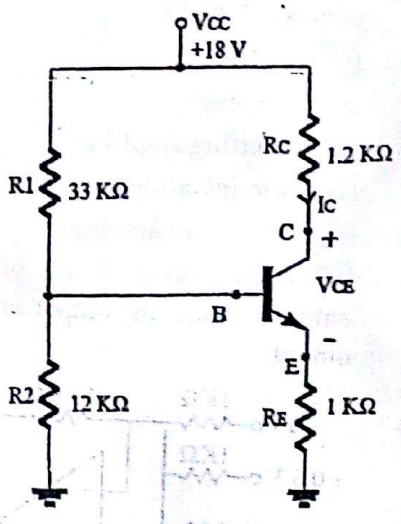
10.

(b) Why is transistor biasing required ? Determine the following for the BJT bias circuit shown in the figure given below. Assume Si-BJT. Given that $\beta = 80$:

(i) Type of biasing

(ii) I_C

(iii) V_{CE}



11.

(a) Write characteristics of an ideal Op-Amp. Also discuss the concept of virtual ground.

(b) Draw neat circuit diagrams and derive the output of the following Op-Amp based circuits :

(i) Adder

(ii) Subtractor

(c) What do you mean by an inverting amplifier ? Discuss, how an Op-Amp can be used as a differentiator ?

12. Write down the characteristics for ideal op-amp. Explain voltage transfer curve for op-amp.
13. Design an Adder circuit using an op-amp to get the output expression as

    i. $V_{out} = -(V_1 + 10\,V_2 + 100\,V_3)$

    where V_1, V_2 and V_3 are the inputs. Given that R_f=100kΩ
14. Draw the diagrams and derive the equations for op-amp as differentiator and integrator.

15. (a) Describe the concept of virtual ground in op-amp. circuits. Draw the circuit diagram of an integrator using op-amp. and explain its working.

    (b) Write short notes on the following in context of op-amps. :

    (i) CMRR

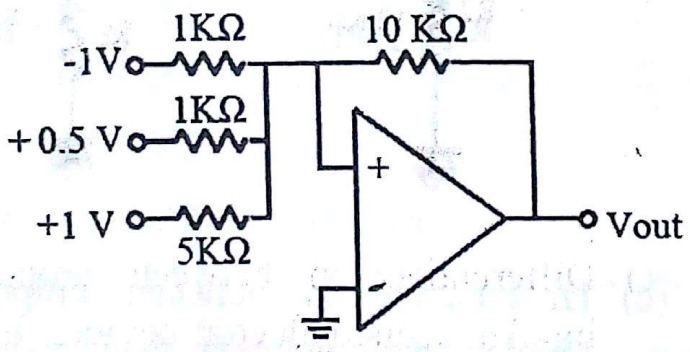
    (ii) Slew rate

    (iii) Inverting amplifier

    (iv) Non-inverting amplifier

    (v) Unity gain amplifier

    (c) Enlist the characteristics of an ideal op-amp. Calculate the output of the following circuit :



16.

(a) In a center tap full wave rectifier, the load resistance is 1 kΩ. Each diode has forward resistance of 10 Ω. The voltage across the secondary winding is 220 V. Find the values of the following :

(i) Peak value of current

(ii) Average value of current

(iii) RMS value of current

(iv) Rectification efficiency

(v) Ripple factor

(b) Derive the following parameters for the half wave rectifier :

(i) Average current

(ii) RMS Voltage

(iii) Rectification efficiency

(c) Write short notes on the following :

(i) Zener diode

(ii) LED

17.

(b) Explain input and output characteristics of CB configuration of npn transistor. Also derive the relation $I_C = \beta I_B + (1+\beta) I_{CBO}$.

(c) A CE amplifier employing an NPN transistor has load resistance RC connected between collector and V_{cc} supply of + 16V. For biasing a resistor R1 is connected between collector and base. Resistor R_2 = 1 kΩ is connected between base and ground and Resistor RE = 1 kΩ is connected between emitter and ground. Draw the circuit diagram and calculate the value of R_1 and R_C if $V_{CE} = 6\,V$, $V_{BE} = 0.2$ V and $\alpha = 0.985$.

18. (b) Fig. 1 shows a simple Zener diode voltage regulator circuit. The voltage across the load is to be maintained constant 12 V while the load current varies from 0 to 200 mA. Find the value of V_Z and R_S. Also find the maximum power rating of Zener diode :

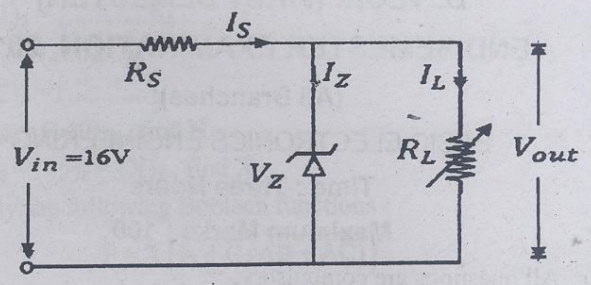


Fig. 1

19.

(a) Explain common base configuration of BJT with suitable diagram. Also draw its input and output characteristics.

(b) A silicon BJT with $\beta = 100$, is shown in Fig. 2, compute the transistor parameters i_B, i_C, i_E and V_{CE}. In which mode the BJT is operating ?

(c) Explain all three configurations of a BJT in terms of :

(i) Input impedance

(ii) Output impedance

(iii) Voltage gain

(iv) Current gain

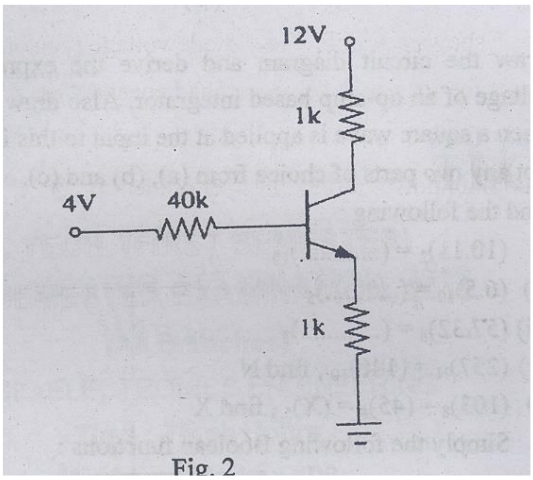


Fig. 2

20.

(a) Explain the ideal characteristics of an op-amp in terms of input impedance, output impedance, differential and common mode voltage gain, common mode rejection ration, slew rate. Under what condition the open loop gain become infinite ?

(b) An op-amp based differential amplifier is shown in Fig. 3. Derive the expression for its output voltage (V_{out}) in terms of V1 and V2. Also find the value of the output voltage, assume $V_1 = 2$ V, $V_2 = 3$ V, when $R_1 = R_2 = 1\ k\Omega$, $R_3 = 5\ k\Omega$, and $R_4 = 8\ k\Omega$.

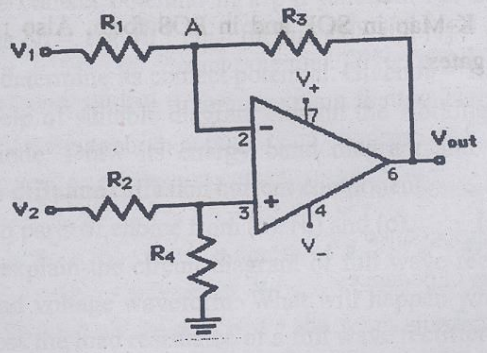


Fig. 3

21.

(c) A full-wave rectifier uses a double diode with each element having a constant forward resistance of 500 Ω. The transformer r. m. s. secondary voltage from the centre tap to each plate is 300 V, the load resistance of 2.5 k Ω. Determine :

(i) d. c. out power (P_{dc}) and a. c. input power (P_{ac}).

(ii) Efficiency (η).