

[Time: Three Hours]

[ Marks:80]

N.B:

1. Question.No.1 is compulsory.
2. Attempt any three questions from remaining five questions.
3. Assume suitable data wherever necessary.

Q.1

Attempt any five questions.

[20 Marks]

- a) Explain any one method of full wave rectification with the help of labelled diagram.
- b) How transistors can be used as switches?
- c) Plot the output waveform for the circuit shown below (Fig.1).

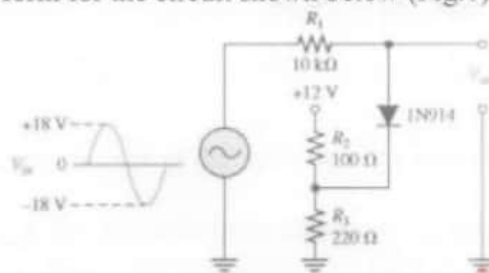


Fig.1

- d) Design an inverting amplifier whose gain is variable over the range  $-4 \leq A \leq 0$  by means of a  $10K\Omega$  pot.
- e) Define and explain harmonic distortion.
- f) Sketch the output waveform for the circuit of fig.2, if the input signal is a 5 V peak sine wave.

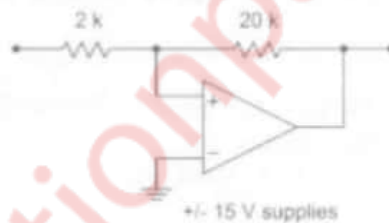


Fig.2

- a) Determine  $V_o$  and  $I_D$  for the series circuit of Fig. 3.

[6 Marks]

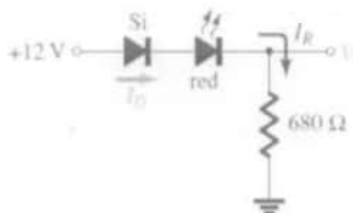


Fig.3

- b) Derive the stability factor  $S(I_{co})$  for emitter stabilized Bias circuit. Calculate  $S(I_{co})$  for the same circuit if  $R_B=510 K\Omega$ ,  $R_C=2.4 K\Omega$ ,  $R_E=1.5 K\Omega$ ,  $V_{CC}=\underline{\hspace{1cm}}$  and  $\beta=100$ .

[8 Marks]

 $= 20V$

- c) What are the characteristics of an ideal op-amp? Explain why open loop configurations are not used in linear applications. [6 Marks]

- Q.3 a) Find  $I_e$  and  $V_{EC}$  for the pnp transistor [6 Marks]

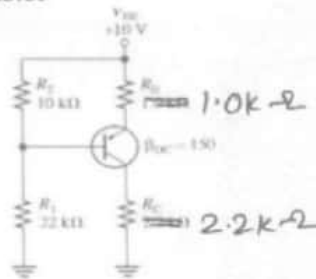


Fig.4

- b) Explain thermal runaway in case of the BJT. How we can do compensation for the same. [6 Marks]
- c) The transistor in Fig.5 has the following maximum ratings:  $P_D(\text{max}) = 800 \text{ mW}$ ,  $V_{CE}(\text{max}) = 15 \text{ V}$ , and  $I_C(\text{max}) = 100 \text{ mA}$ . Determine the maximum value to which  $V_{CC}$  can be adjusted without exceeding a rating. Which rating would be exceeded first? [8 Marks]

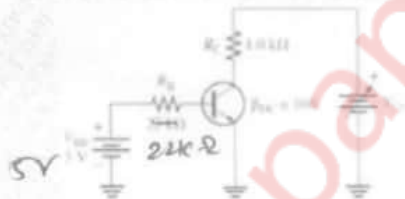


Fig.5

- Q.4 a) Explain the working of D MOSFET with neat diagrams. [8 Marks]
- b) Explain with a neat diagram a transformer coupled audio power amplifier. [6 Marks]
- c) Sketch the 3-input inverting averaging circuit and derive an equation for the output voltage. [6 Marks]
- Q.5 a) Write the design procedure for High pass filter with suitable example. [8 Marks]
- b) What are the conditions for stable oscillations? Draw the circuit of Wein Bridge oscillator and derive equations for frequency and gain. [6 Marks]
- c) What is the basic difference between a basic comparator and the Schmitt trigger. [6 Marks]
- For an inverting Schmitt trigger if  $R_1 = 180 \Omega$ ,  $R_2 = 80 \text{ K}\Omega$ ,  $V_{in} = 500 \text{ mV}_{pp}$  sine wave, and the saturation voltages are  $\pm 15 \text{ V}$ . Determine upper, lower threshold voltage and hysteresis voltage.

Q.6

- a) Draw and explain series voltage regulator. [6 Marks]  
 b) Explain four types of controlled sources using opamp. [6 Marks]  
 c) Derive the expression for the circuit shown below, Plot the waveforms for output voltage of the ideal op-amp shown in fig.6 for the triangular-wave input shown below. [8 Marks]

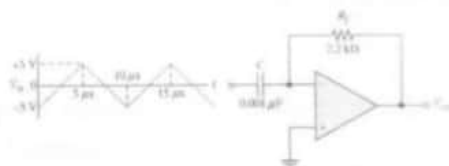


Fig.6