

Time: 3 Hours

16 MAY 2018

Marks: 80

N.B.: (1) Question No. 1 is compulsory.

(2) Solve any three questions from the remaining five.

(3) Figures to the right indicate full marks

(4) Assume suitable data if necessary and mention the same in answer sheet.

Q.1 Attempt any 5 questions

a) Prove that for a JFET the gate-source bias for zero temperature drift of drain current is at  $|V_p| - 0.63$  volts. [20]

b) Explain the hybrid pi model of BJT.

c) Explain Zener as voltage regulator.

d) Consider a BJT has parameters  $f_T = 500\text{MHz}$  at  $I_C = 1\text{mA}$ ,  $\beta = 100$  and  $C_{\mu} = 0.3\text{pF}$ . Calculate bandwidth of  $f_{\beta}$  and capacitance  $C_{\pi}$  of a BJT.

e) Draw and explain small signal model of a diode.

f) Why should  $R_C$  be as large as possible in the design of CE amplifier?Q.2 a) Design a voltage divider bias network using a supply of 24 V, a transistor with  $\beta = 110$  and an operating point of  $I_{CQ} = 4\text{mA}$  and  $V_{CEQ} = 8\text{V}$ . Assume [10]

$$V_E = \frac{1}{8} V_{CC}$$

b) Explain the fabrication steps of passive elements. [5]

c) What are the important JFET parameters and define it from characteristics. [5]

Q.3 a) Design the resistors of a single stage CS amplifier for audio frequency with BFW11 with  $I_{DS} = (3.3 \pm 0.6)\text{mA}$  and  $|A_v| = 12$ . [10]

b) Draw CS JFET amplifier with self bias circuit and derive the expression for voltage gain input impedance and output impedance. [10]

Q.4 a) Draw small signal hybrid parameter equivalent circuit for CE amplifier and define the same. What are the advantages of h parameters? [10]

b) For the circuit shown below in Fig.4b, the transistor parameters are  $V_{BE(on)} = 0.7\text{V}$ ,  $\beta = 200$  and  $V_A = \infty$ .  $V_{BE}$  [10]

i) Derive the expression for lower cut-off frequency (or time constant) due to input coupling capacitor.

ii) Determine lower cut-off frequency and midband voltage gain.

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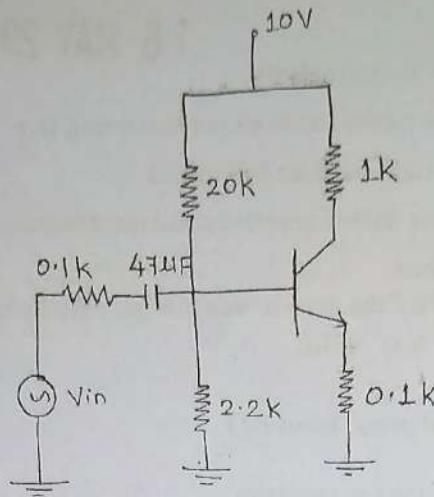


Fig.4b

Q.5 a) Design an L section LC filter with full wave rectifier to meet the following specifications: The DC output voltage  $V_{DC} = 220$  V, deliver  $I_L = (70 \pm 20)$  mA to the resistive load and the required ripple factor is 0.04. [10]

b) For the circuit shown below in Fig.5b, the transistor parameters are  $V_{BE(on)} = 0.7$  V,  $\beta = 100$  and  $V_A = \infty$ . Determine  $Z_i$ ,  $Z_o$  and  $A_v$ . [10]

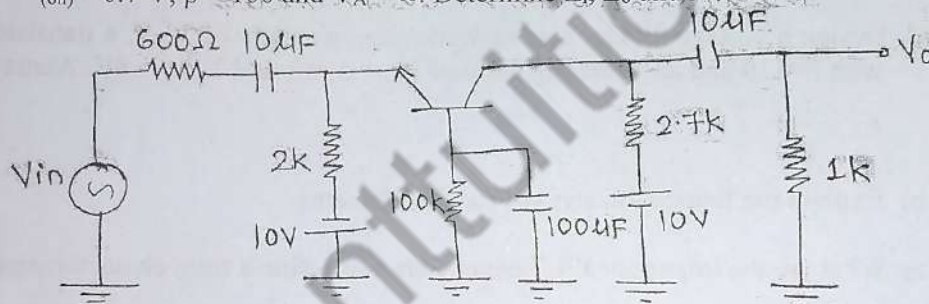


Fig. 5b

Q.6 Short notes on: (Attempt any four) [20]

- BJT high frequency equivalent circuit
- Types of resistors and capacitors
- Stability factors of various biasing techniques of BJT
- Different types of filters
- Comparison of BJT CE and JFET CS amplifier

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