

B.Tech. (Sem.III) (Main/Back) Examination-2014
Electrical Engineering
3EE1 Electronic Devices & Circuits

Time : 3 Hours]

[Total Marks : 80]
 [Min. Passing Marks : 24]

Instructions to Candidates :
 Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

UNIT - I

- Explain Energy band theory of crystals. On its basis bring out the difference between Insulator, Semiconductor and Metals. (8)
 - Find the conductivity of Silicon
 - Under intrinsic condition at 300°K
 - With donor impurity of 1 part in 5×10^7 . Given that, intrinsic concentration $(n_i) = 1.5 \times 10^{10}/\text{cm}^3$, mobility of electron $(\mu_n) = 1300 \text{cm}^2/\text{v-s}$, mobility of holes $(\mu_p) = 500 \text{cm}^2/\text{v-s}$, $e = 1.6 \times 10^{-19} \text{C}$ and no. of Si atoms $= 5 \times 10^{22}/\text{cm}^3$ at a temperature of 27°C. (8)

OR

- What are the step graded and continuously graded semiconductor? Explain. (8)
 - Explain Hall Effect and derive the mathematical expression for Hall coefficient, also describe its applications. (8)

UNIT - II

- Draw the output wave of the following circuit (fig. 1) (8)

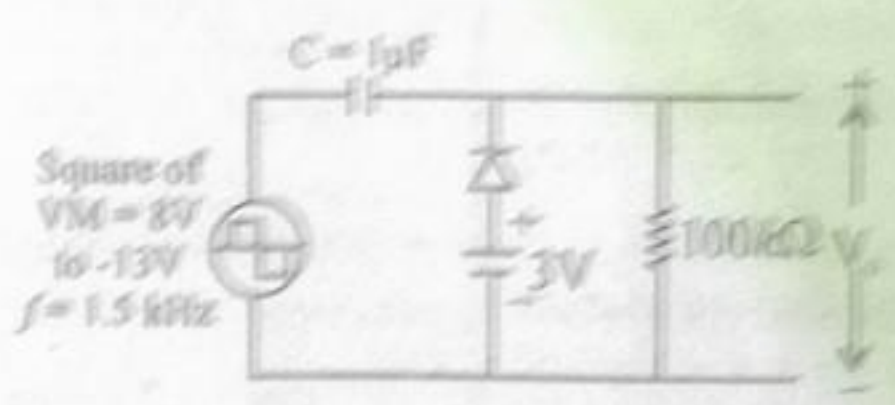


Fig. 1

- Explain the working principle of UJT. Also explain why UJT has a negative resistance region? (8)

OR

- A full wave rectifier uses diode with forward resistance of 6Ω. The transformer secondary is centre tap with output 10-0-10 r.m.s. and has resistance of 8Ω of each half section. Calculate
 - Percentage regulation at 0.1 A
 - Power conversion efficiency
 - Ripple voltage across load
 - PIV of each diode
 - Write short notes on:
 - Schottky diode
 - Voltage multiplier

UNIT - III

- Draw with circuit diagram of transistor common base configuration input and output characteristics. Also indicate the active, saturation and cut-off region.
 - Determine the value of R_1 and R_2 for the given circuit, Given that $V_{cc} = 24\text{V}$, $R_c = 330\Omega$, $R_B = 130\Omega$, $V_{BE} = 0.3\text{V}$, $I_C = 20\text{mA}$, $\alpha = 0.99$ and stability factor $S = 10$. (see fig. 2).

OR

- Deduce expression for A_v , R_p , R_o and A_{is} in a common collector BJT transistor amplifier in term of h -parameters.
 - Explain the significance of current gain alpha (α) and beta (β) in a transistor using various current component.



Fig. 2

UNIT-IV

4. (a) Describe the carrier transportation in N-channel depletion type MOSFET using suitable diagram and also explain its transfer characteristics.
 (b) For the given network (Fig. 3) $I_{DSS} = 8\text{mA}$ and $V_p = -8\text{volts}$.

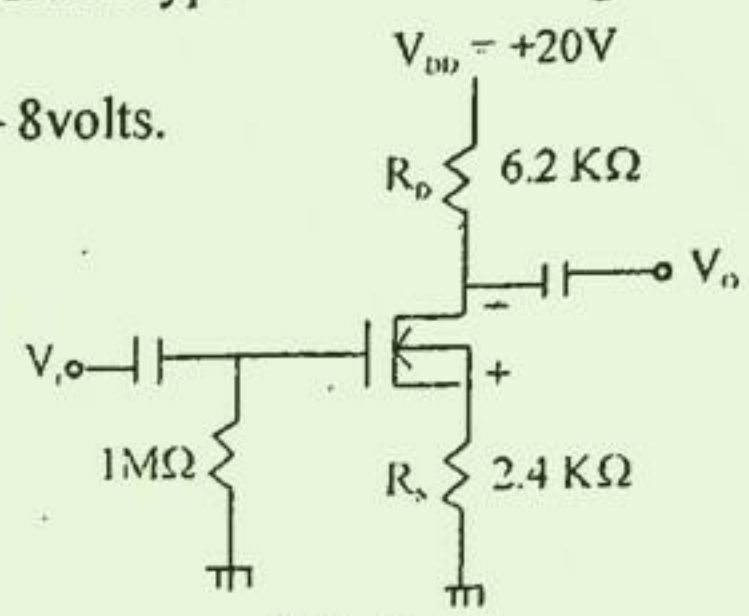


Fig. 3

Determine the following

- (i) I_{DQ}
- (ii) V_{GSQ}
- (iii) V_D

OR

4. (a) Describe briefly the construction of N-channel JFET. Also define pinch off voltage. Draw its characteristics.
 (b) For the given fig. 4. Find out the values of R_i and R_o
 Given that $g_{mo} = 12.5\text{ m Mho}$, $R_S = 5\text{K}\Omega$, $R_2 = \alpha$, $R_1 = 1\text{m}\Omega$, $R = 50\Omega$, $R_L = 10\text{K}\Omega$, and $V_{DD} = 15\text{V}$

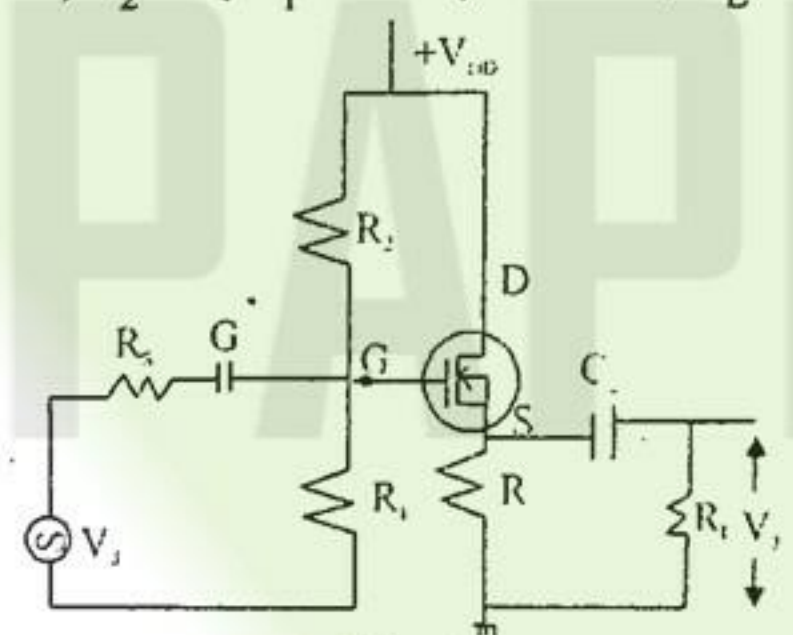


Fig. 4

The transfer characteristic is given by $I_D = 12.5 \left(1 + \frac{V_{gs}}{2} \right)^2 \text{ mA}$

UNIT-V

5. (a) In 2-stage RC coupled BJT amplifier deduce midband gain, Low frequency gain and high frequency gain in terms of circuit component.
 (b) D.C. amplifier has a voltage gain of 40 dB when ambient temperature increase from 25 to 50°C. The output changes by 0.5 volts. What is the drift of the amplifier referred to input?

OR

5. (a) For the bootstrap circuit shown in the fig. 5. Calculate A_i , R_i and A_v . The transistor parameters are $h_{ie} = 2\text{K}$, $h_{fe} = 100$, $1/h_{oe} = 40\text{K}$, $h_{re} = 2.5 \times 10^{-4}$

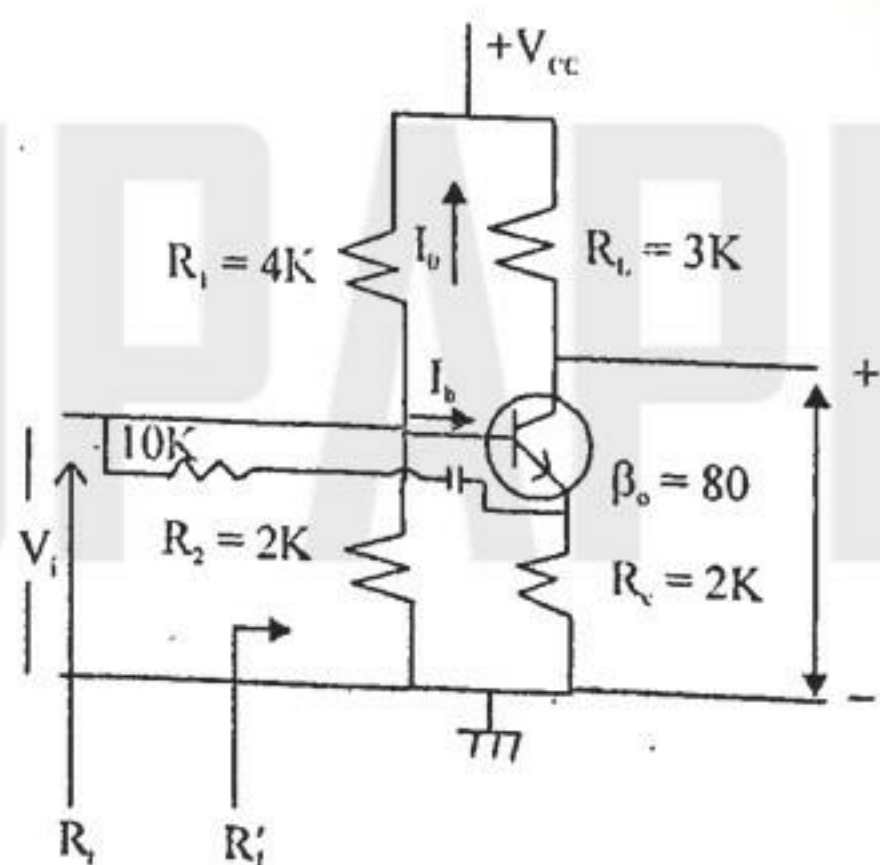


Fig. 5

- (b) Write short notes on following
 (i) Boot strapping
 (ii) Miller's theorem.