3E1641

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B.Tech .III Semester (Main/Back) Examination -2014
3EE1A-Electronics Devices & Circuits

Time : 3 Hours

Maximum 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

1. a) Explain Energy band theory of crystals. On its basis bring out the difference between Insulator, Semiconductor and metals. (8)

   b) Find the conductivity of Silicon

      i) Under intrinsic condition at 300^0k

      ii) With donor impurity of 1 part in 5×10^7. Given that, intrinsic concentration (ηi)=1.5×10^{10}/cm^3, mobility of electron (μ_n)= 1300 cm^2/v-s, mobility of holes (μ_p)=500cm^2/v-s, e=1.6×10^{-19}C and no. of S$_i$ atoms =5×10^{22}/cm^3 at a temperature of 27^0C. (8)

OR

1. a) What are the step graded and continuously graded semiconductor? Explain. (8)

   b) Explain hall-effect and derive mathematical expression for hall-Coefficient, also describe its application. (8)

Unit - II

2. a) Draw the output wave for of the following circuit (8)

$C = 1\mu F$

Square of
Vm= 8v
to -13v
f = 1.5 kHz

100kΩ

Vo

3v
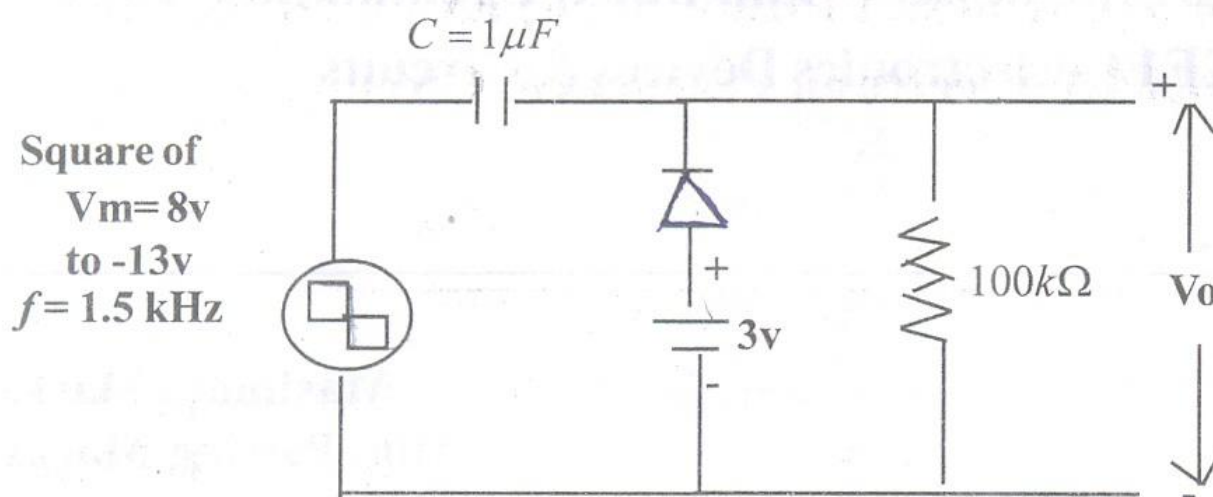
b) Explain the working principle of UJT. Also explain why UJT has a negative resistance region? (8)

OR

2. a) A full wave rectifier uses diode with forward resistance of $6\,\Omega$. The transformer secondary is centre tap with output 10-0-10 r.m.s and has resistance of $8\,\Omega$ of each half section. Calculate (8)

   i) Percentage regulation at 0.1 A

   ii) Power conversion efficiency

   iii) Ripple voltage across load

   iv) PIV of each diode.

   b) Write short notes on:-

   i) Schottky diode

   ii) Voltage multiplier. (8)

Unit - III

3. a) Draw with circuit diagram of transistor common base configuration input and output characteristics. Also indicate the active, saturation and cut-off region. (8)

   b) Determine the value of R_1 and R_2 for the given circuit. Given that v_{cc}=24v, R_c=330Ω, R_E=130Ω V_{BE}=0.3 V, I_C=20mA, α=0.99 and stability factor S=10. (8)

+Vcc
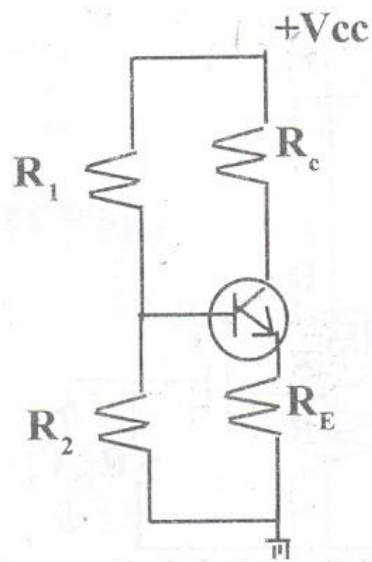
OR

3. a) Deduce expression for Ai, Av, Ri, Ro and A is in a common collector bJT transistor amplifier in term of h-parameters. **(8)**

    b) Explain the significance of current gain alpha(α) and beta(β) in a transistor using various current component. **(8)**

Unit - IV

4. a) Describe the carrier transportation in N-channel depletion type MOSFET using suitable diagram and also explain its drain transfer characteristics. **(8)**

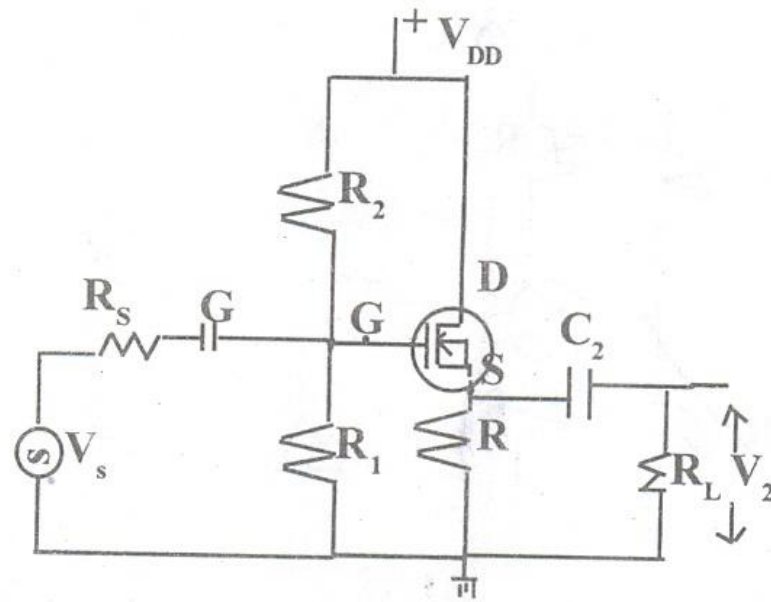   b) For the given network I_{Dss} =8mA and V_p = -8 volts.

    Determine the following

    i) I_{DQ}

    ii) V_{GSQ}

    iii) V_D **(8)**
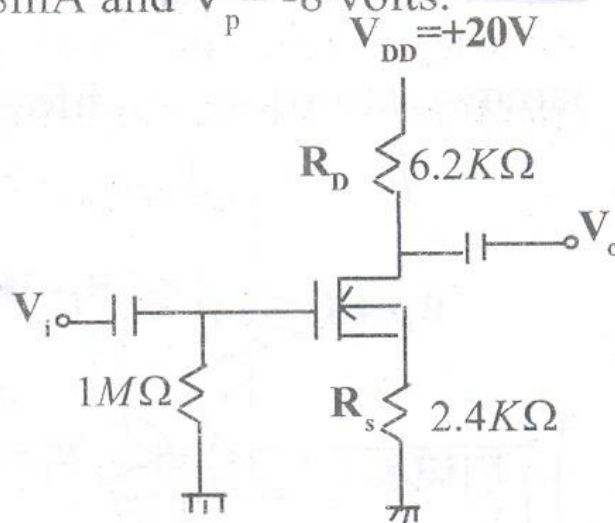
OR

4. a) Describe briefly the construction of N-channel JFET. Also define pinch off voltage. Draw its characteristics **(8)**

    b) For the given figure, find out the values of Ri and Ro

    Given that g_{mo} =12.5m Mho, R_s=5kΩ, R_2=α, R_1=1mΩ R=50Ω, R_L=10kΩ and V_{DD}=15V

3E1641 (3) **[Contd....**

The transfer characteristic is given by $I_D = 12.5 \left(1 + \dfrac{V_{gs}}{2}\right)^2$ mA **(8)**

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. **(8)**

b) D.c amplifier has a voltage gain of 40dB when ambient temperature increase from 25 to 50°C. The output changes by 0.25 volts. What is the drift of the amplifier referred to input? **(8)**

OR

5. a) For the bootstrap circuit shown in the fig. Calculate Ai ; Ri and Av The transistor parameters are hie=2K, hfe=100, 1/hoe=40K, hre=2.5×10⁻⁴. **(10)**
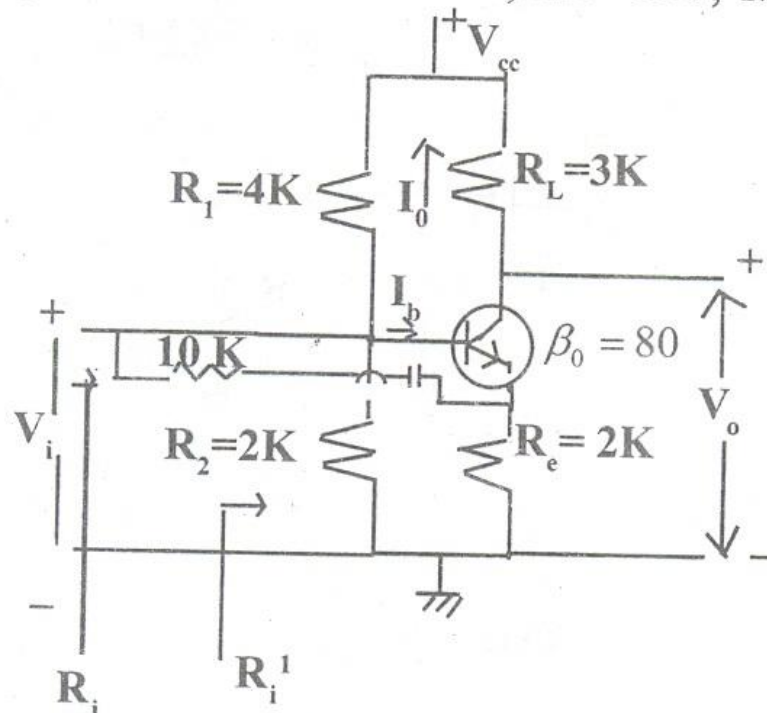
b) Write short notes on following

i) Boot strapping

ii) Miller's theorem. **(6)**