3E1492

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3E1492

B.Tech. IIIrd Semester (Main/Back) Examination, Feb. -2011

Electronics Devices & Circuits

(Common for main & Back of 3EC2, 3AI2, 3EI2 & 3BM2)

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 may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly).*

Unit - I

1. a) Sketch the energy-band picture for

i) an intrinsic,

ii) an n-type, and

iii) a p-type semiconductor. Indicate the position of the fermi, the donor, and the acceptor levels. **(8)**

b) A semiconductor is doped with both donors and acceptors of concentrations N_D, and N_A, respectively. Write the equation or equations from which to determine the electron and hole concentration (n and p) **(8)**

OR

a) Describe the Hall effect. What properties of a semiconductor are determined from a Hall effect experiment? **(8)**

b) Write the equation of continuity for holes. Explain the physical meaning of each term in the equation. **(8)**

Unit - II

2. a) Draw the piecewise linear volt-ampere characteristic of a p-n diode. What are the circuit model for the ON state and the OFF state. **(8)**

b) Determine V_0, I_1, I_{D_1}, and I_{D_2} for the parallel diode configuration of fig.1 **(8)**

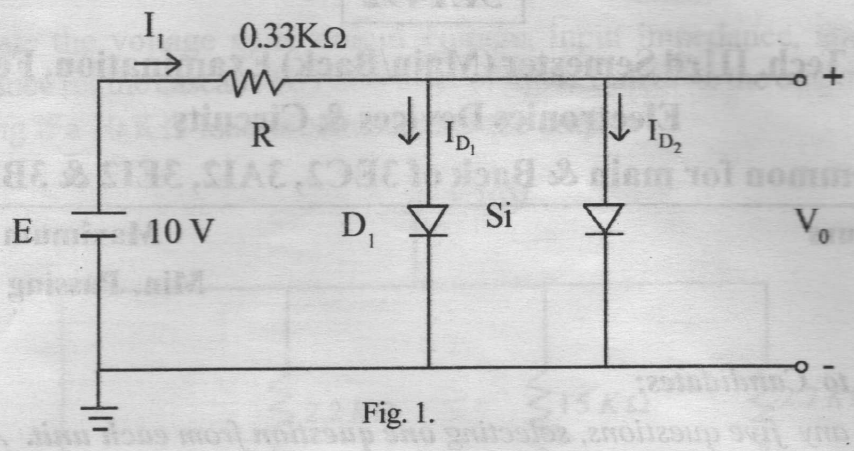

Fig. 1.

OR

a) Draw the UJT static emitter characteristic curve and UJT equivalent circuit. **(8)**

b) Determine the current I for the network of Fig.2 **(8)**

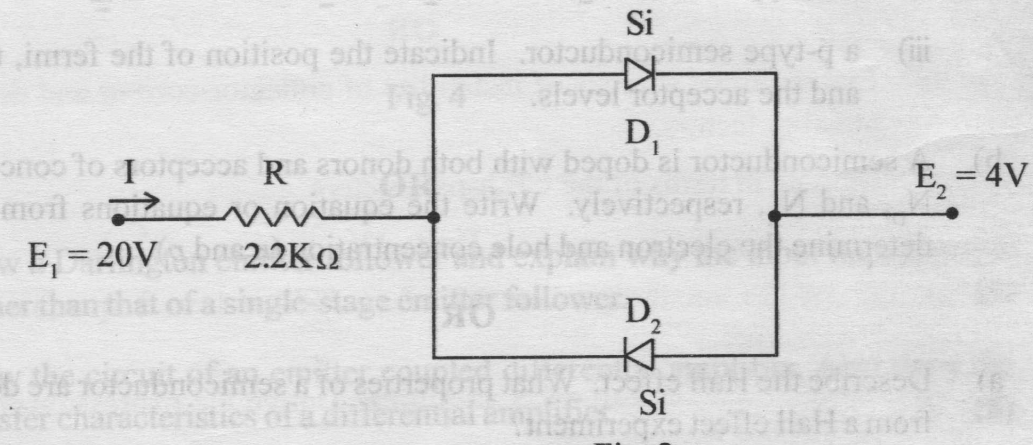

Fig. 2

Unit - III

3. a) Write the Ebers and Moll equations and sketch the circuit model which satisfies these equations. **(8)**

b) Determine the following for the fixed-bias configuration of fig.3

i) I_{BQ} and I_{CQ}

ii) V_{CEQ}

iii) V_B and V_C

iv) V_{BC}.

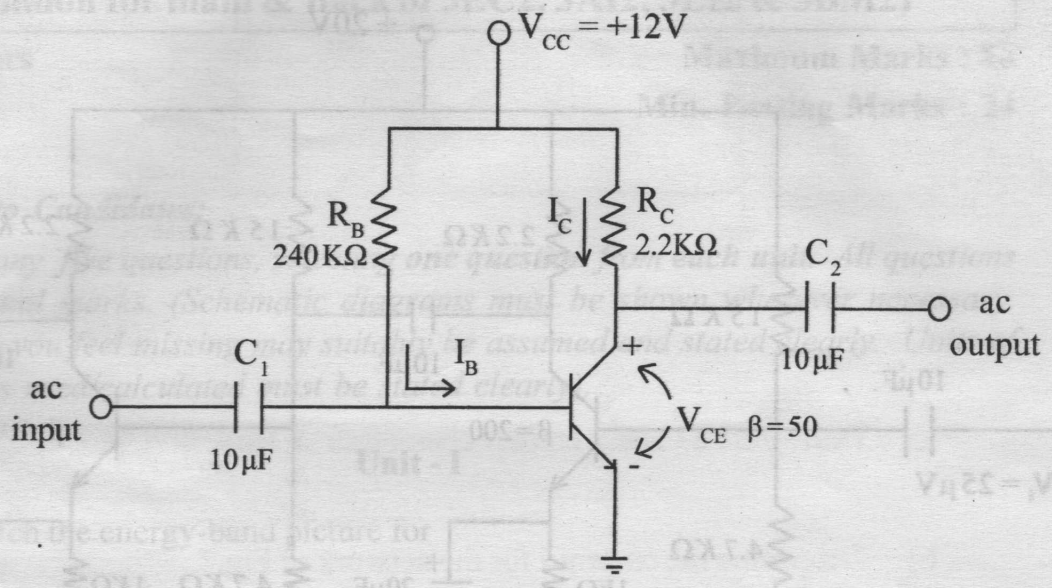

Fig. 3

(2×4=8)

OR

a) List the three sources of instability of collector current and define the three stability factors. **(8)**

b) Find h_{re} in terms of the CB h-parameters. **(8)**

Unit - IV

4. a) Show the small-signal model of an FET at low frequencies and at high frequencies. **(8)**

b) Sketch the circuit of a CS amplifier. Derive the expression for the voltage gain at low frequencies. **(8)**

OR

a) Sketch the cross section of a P-channel enhancement MOSFET. **(4)**

b) Draw the E - MOSFET voltage divider configuration and their AC equivalent network. **(6)**

c) *Derive the relation for* g_m for enhancement type MOSFETs. **(6)**

Unit - V

5. a) Describe the Miller's theorem. **(6)**

b) Calculate the voltage gain, output voltage, input impedance, and output impedance for the cascade BJT amplifier of fig.4. Calculate the output voltage resulting if a 10 KΩ load is connected to the output. **(10)**

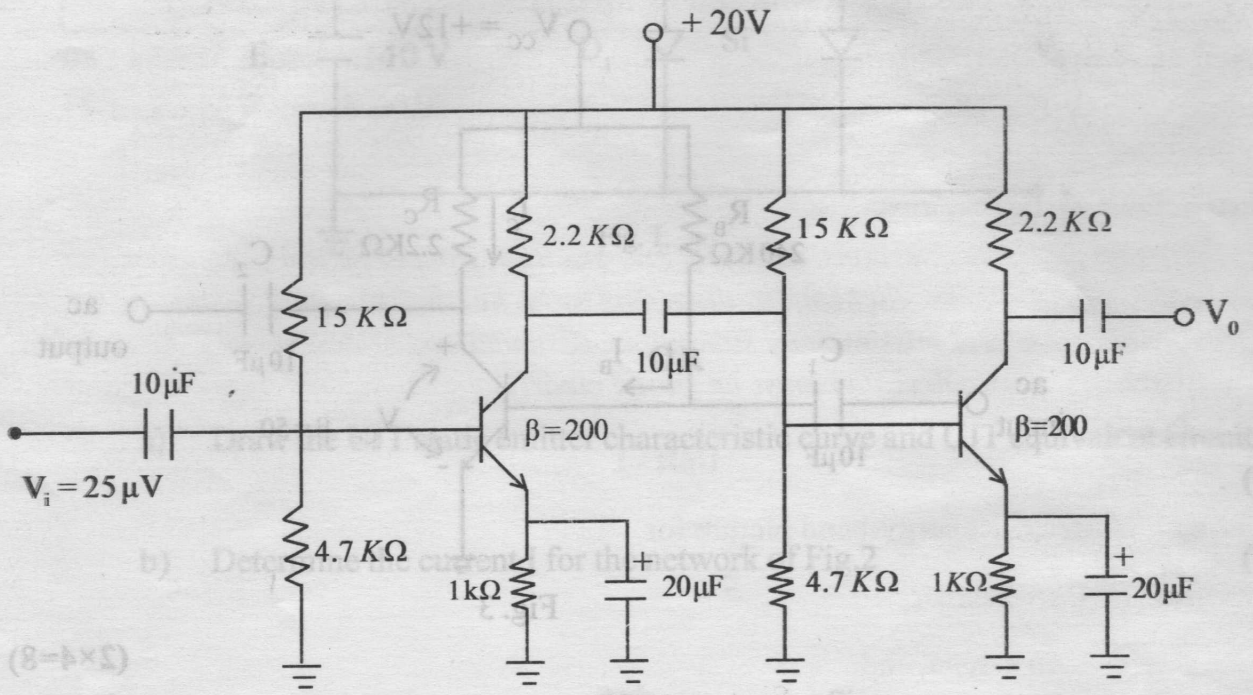

Fig. 4

OR

a) Draw a Darlington emitter follower and explain why the input impedance is higher than that of a single-stage emitter follower. **(8)**

b) Draw the circuit of an emitter coupled differential amplifier. Also draw the transfer characteristics of a differential amplifier. **(8)**