

**3E1492**

Roll No. \_\_\_\_\_

[Total No. of Pages : **4**]**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
- an intrinsic,
  - an n-type, and
  - 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)

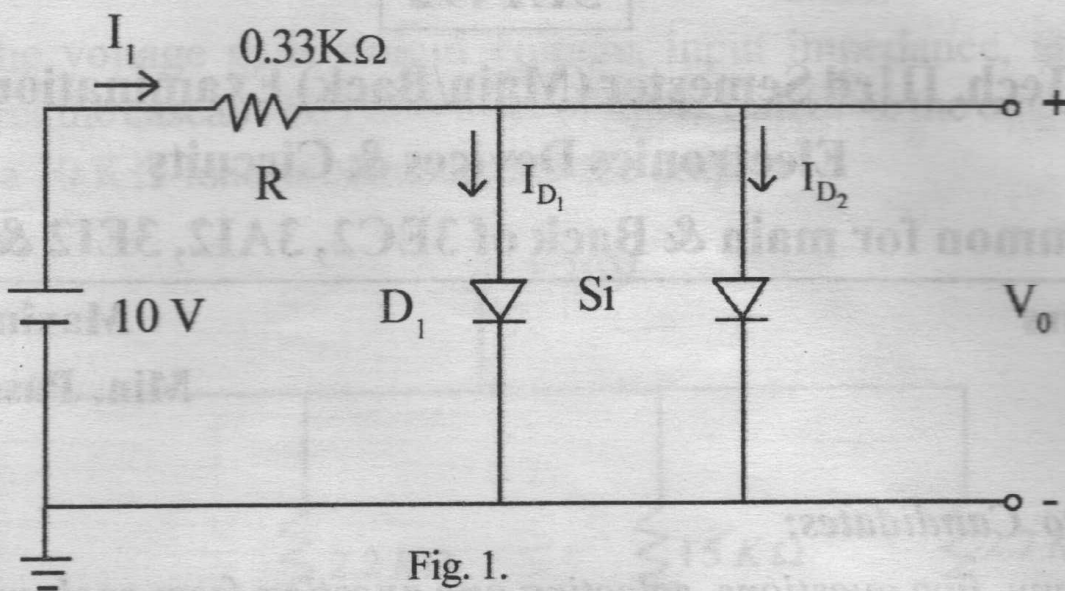


Fig. 1.

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)

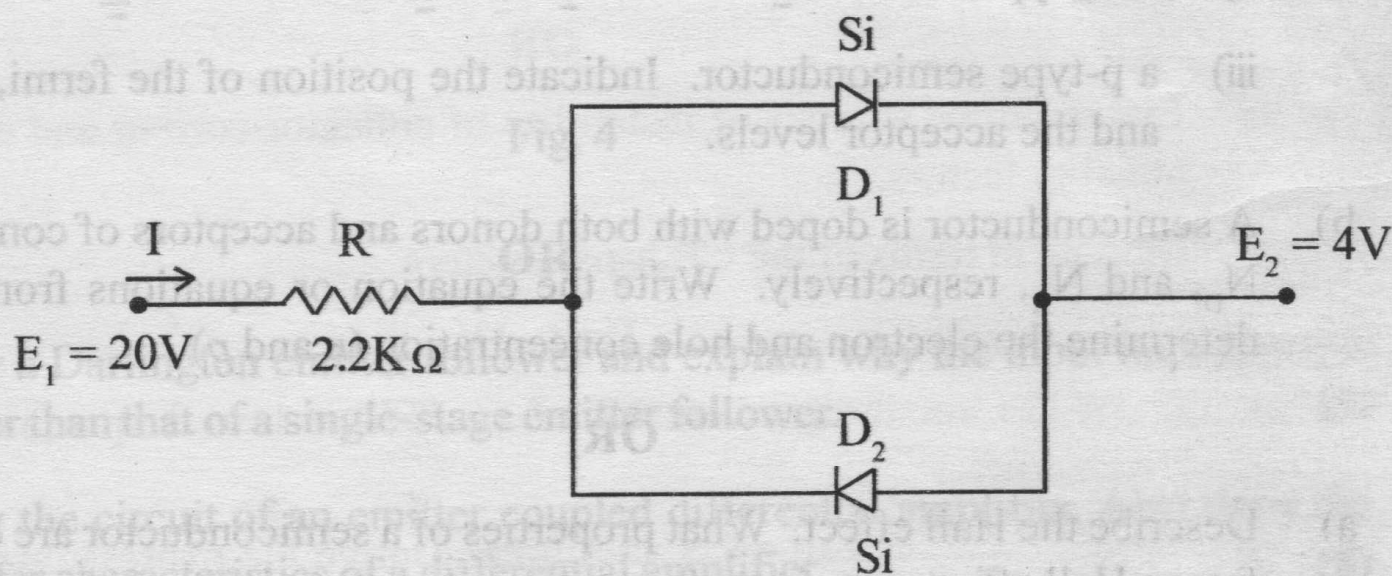


Fig. 2

### 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)  $V_{BC}$

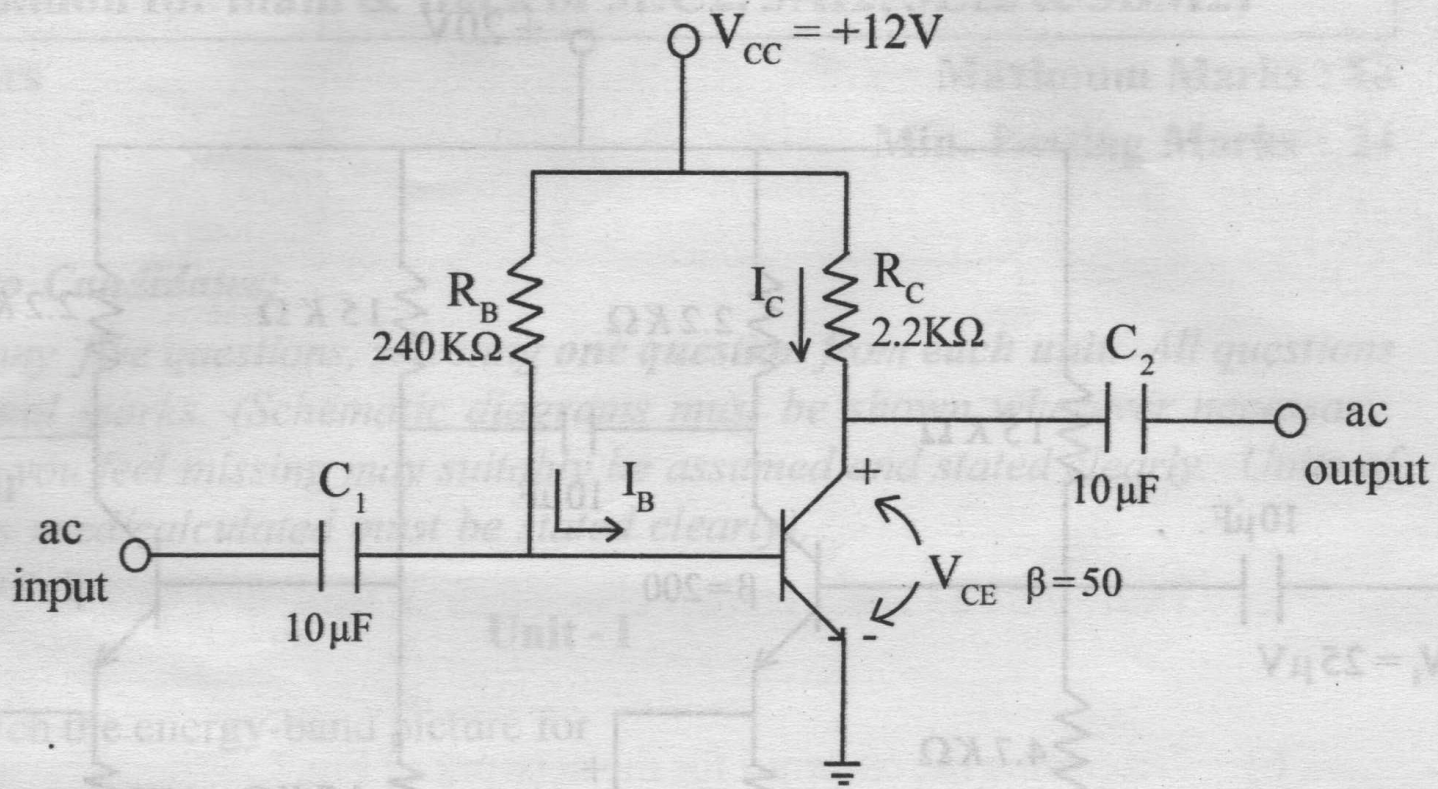


Fig. 3

(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  $10\text{ K}\Omega$  load is connected to the output. (10)

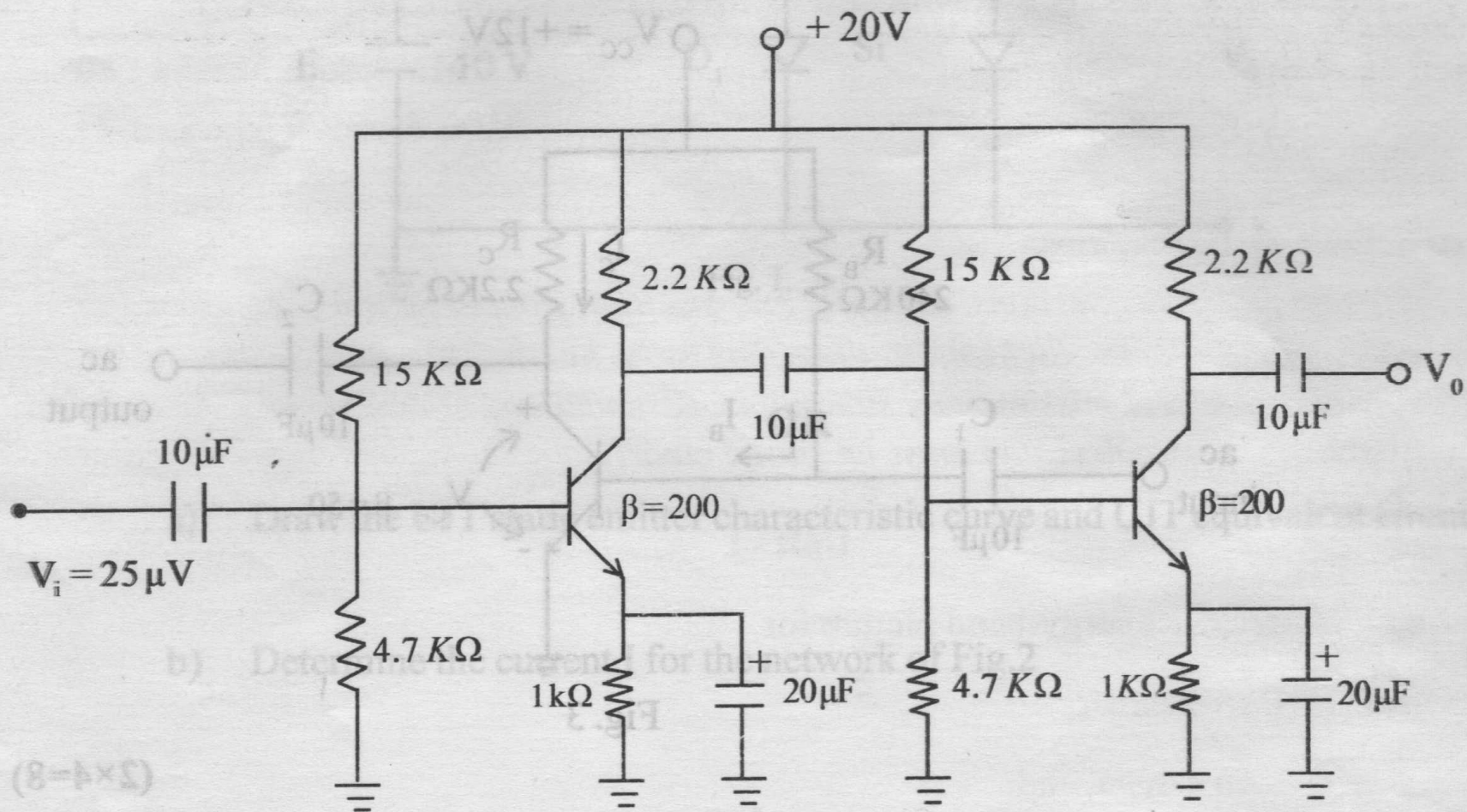


Fig. 4

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)