Bengal Engineering and Science University
Final Examination 2012-November
3rd Sem E&T.C. (ET-304)
Subject: Analog Electronics

First Half

Answer any three questions.

1. a) Draw the circuit diagram of common source stage with diode load and explain its operation.

   b) Compute the voltage gain of the common source stage with resistive load.

2. a) Define cascode stage topology for MOS circuit. What is the difference between cascade stage and cascode stage topology.

   b) Draw the circuit diagram of cascode stage topology, and with small signal equivalent circuit explain its operation.

3. a) Draw the circuit diagram of source follower stage MOS amplifier and explain the operation.
   b) State the advantages and disadvantages of source follower MOS amplifier.

4. a) Explain the differences between single ended and differential operation with necessary diagram.
   b) Draw the circuit diagram of MOS basic differential pair circuit and explain its operation.
   c) Draw the MOS current sink circuit and explain their operation.

5. Write short notes on:
   (i) Current mirror
   (ii) Current source
   (iii) Feedback system

Electronics & Telecommunication Engineering Department
Bengal Engineering & Science University, Shibpur
Howrah-711 103.
Odd Semester Examination-December,2012
ANALOG ELECTRONICS(ET 304)

F.M. 35

2nd Half

Answer question no.1 and any three from the rest.

1. Obtain the expressions for the input impedance and voltage gain of the circuit shown in Fig.1 3+2

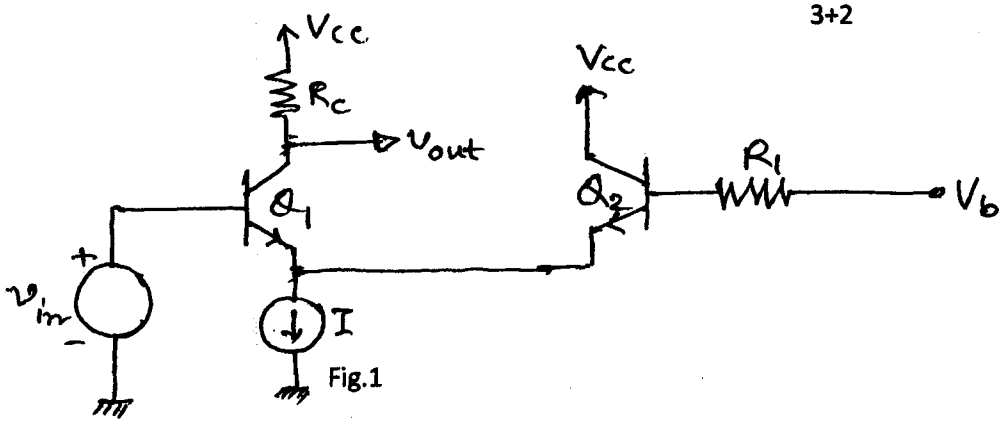

Fig.1

2.(a) Find the minimum value of R_C for which the transistor in the circuit(Fig.2) remains in saturation. Assume, β=100, V_{CE} sat = 0.8V and V_{CE} sat= 0.2V; 4

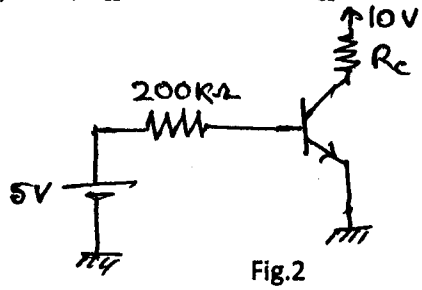

Fig.2

(b) Determine the voltages at all nodes and the currents through all branches of the circuit shown in Fig. 3. The minimum value of β is specified to be 30 ; 6

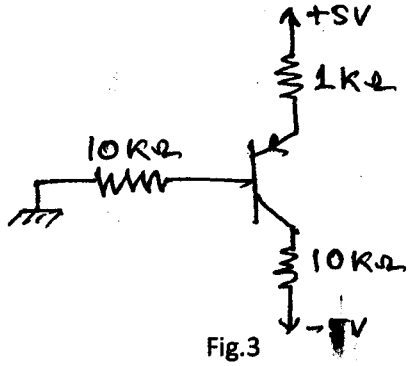

Fig.3

3.(a) An amplifier has a voltage gain of 10, an input resistance of 1 KΩ and an output resistance of 10Ω. The amplifier is connected to a sinusoidal voltage source of 2V r.m.s., which has a resistance of 100Ω, and to a load resistance of 50Ω. What will be the r.m.s. value of the output voltage?

4

(b) Estimate the small signal voltage gain and the input and output resistances of the following circuit(Fig.4)

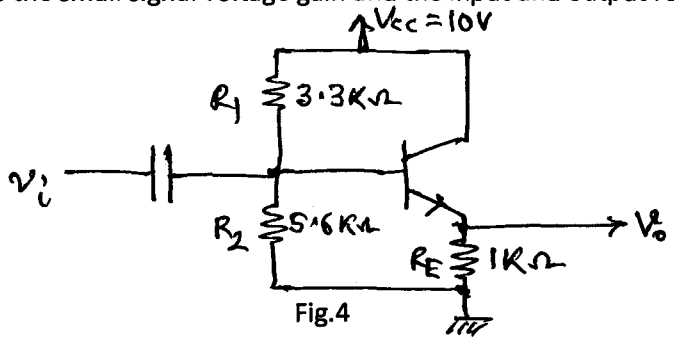

Fig.4

6

4. (a) For the circuit shown in Fig.5, prove that ; Assume, Q1 and Q2 are to be identical.

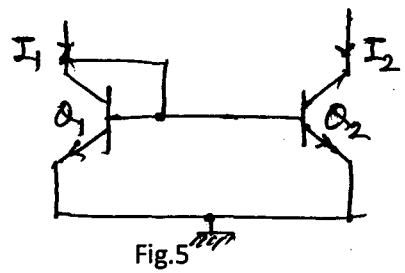

Fig.5

4

(b) It is desired to generate two currents equal to 50μA and 500μA from a reference of 200μA.

(i) Design the current mirror circuit.

(ii) Compute the errors after connecting the follower.

2+4

5.(a) Obtain the expression for output impedance Rout of a CE amplifier with degenation resistor R_E. Assume,

4

(b) Draw the circuit diagram of a cascode amplifier. Determine the transconductance of the circuit and hence, the voltage gain of the amplifier.

6

6. (a) An amplifier with open-loop voltage gain A_V= 1000 ±100 is available. It is necessary to have an amplifier whose voltage gain varies by no more than ±0.1 percent.

(i) Find the reverse transmission factor β of the feedback network used.

(ii) Find the gain with feedback.

2+2

(b) For the ciruit shown in the Fig. 6 , find the open-loop A and the feedback factor β. Assume, I_{C1} = 0.6mA, I_{C2} = 1 mA, I_{C3} = 4mA and h_{fe} =100 ;

4+2