53 (EC 301) ELDC

2018

ELECTRONIC DEVICES AND CIRCUITS

Paper : EC 301

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions out of **six**.*

1. *(a)* Describe the operation of Common-Collector amplifier as an emitter follower. Briefly describe why it can be used as a voltage buffer. 8+2

   (b) Describe the operation of a Series Voltage regulator. 4

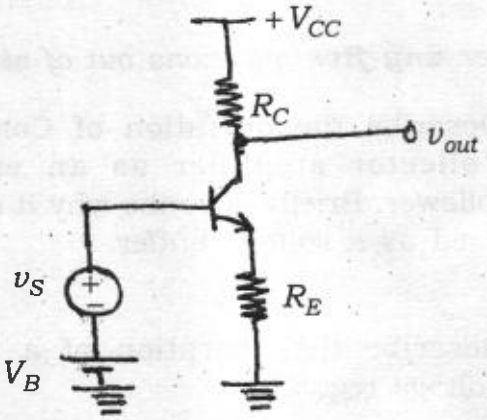
   (c) Derive the expression for transconductance of a BJT in Active mode. 6

2. *(a)* An nMOSFET in saturation mode can be used as a voltage controlled current source. Justify with I_{DS} ~ V_{DS} characteristics. 5

(b) Draw the circuit diagram for 2-stage cascaded CE-CE amplifier (DC coupled and RC coupled), mention the features of both types and draw small signal diagrams for each. 1+2+2

(c) Describe the operation of Boost regulator and write the expression for its duty cycle. 10

3. *(a)*

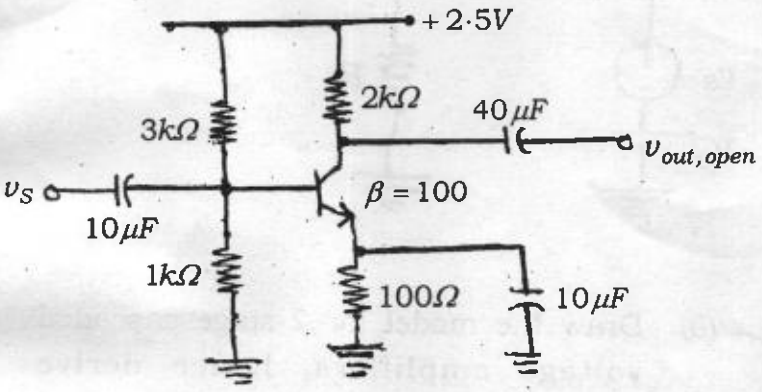


Derive the expressions for open circuit voltage gain, input resistance, output resistance for above circuit.

6+4+2

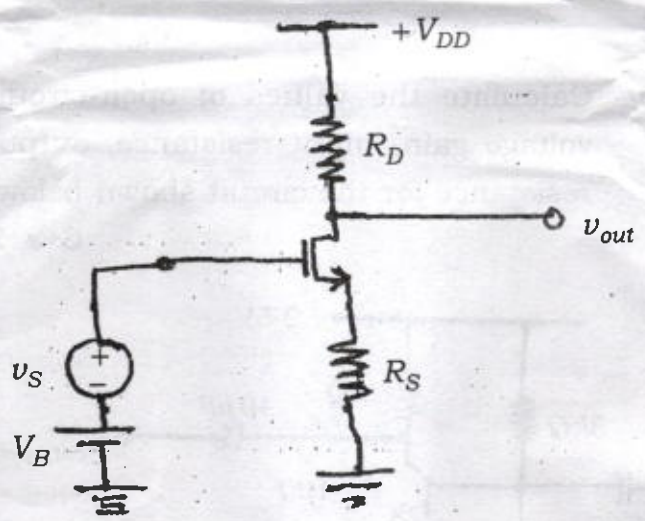
(b) Explain the operation and efficiency of a Class-AB amplifier, using proper circuit diagram and transfer characteristics. 8

4. (a) Calculate the values of open-circuit voltage gain, input resistance, output resistance for the circuit shown below. 6+2+2



(b) Describe the operation of emitter follower as a Class-A amplifier, hence derive the efficiency. 10

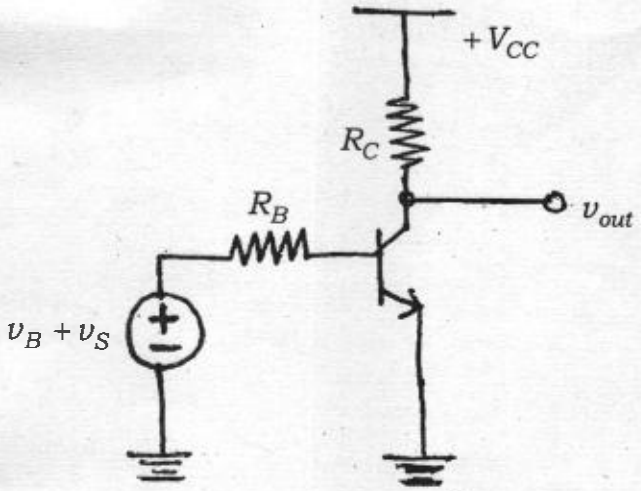
5. *(a)* Derive the expression for open-circuit voltage gain, R_{in} and R_{out} for the circuit shown below. 6+2+2



(b) Draw the model for 2-stage cascaded voltage amplifiers, hence derive the expressions for input loading, inter-stage loading and output loading parameters. 6

(c) Describe the operation of series regulator using Zener diode with proper circuit diagram. 4

6. *(a)* Derive the expression for $-3dB$ frequency of the amplifier shown below in HF band. 6



(b) Mention the features of CE-CE cascaded amplifiers with circuit diagram. 4

(c) Mention the parasitic capacitances for a BJT in Active mode, hence draw the small-signal model in HF band. 4

(d) Derive the small-signal voltage gain, input resistance, output resistance of a common-source amplifier. 6
