53 (EC 301) ELDC

2019

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* **7**.

1. *(a)* Why power amplifiers are necessary in electronic system? Mention the important parameters used for evaluating their performances. Explain the operation of class A power amplifier. 2+2+6

   (b) Describe the operation of Zener diode based series regulator and derive the expression for its duty cycle. 8+2

Contd.

2. *(a)* Determine the node voltages and branch currents in the circuit given below. *(Fig.1)* 4

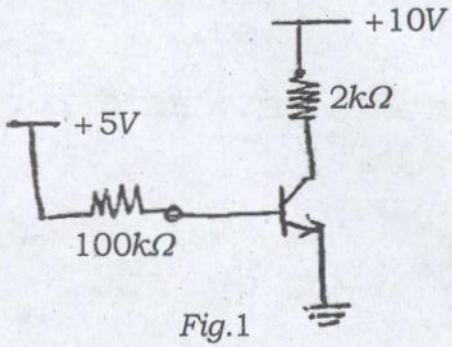

Fig.1

(b) Derive the expression for small-signal voltage gain, input resistance and output resistance for the amplifier shown in *Fig* 2. 10

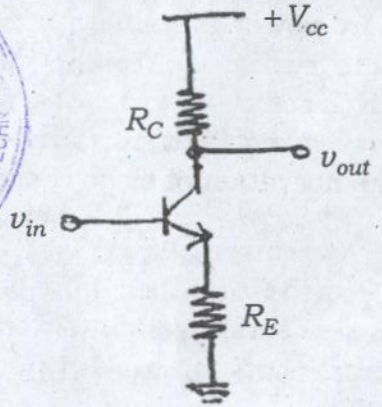

Fig.2

(c) Write a short note on shunt voltage regulator. 6

3. *(a)* Describe the operation of Class-B power amplifier and hence derive its efficiency. 8+2

(b) Common-Collector amplifier can work as a voltage buffer. Justify with proper expressions. 10

4. *(a)* Describe the need of tuned amplifiers in electronic communication systems. Classify them. Derive the expression for small-signal voltage gain, hence plot the frequency response. 2+2+6

(b) Explain the operation of Buck-Boost regulator and derive its efficiency. 8+2

5. *(a)* Give a detail comparison (table format) about the small-signal operation of BJT-amplifiers. and hence discuss which amplifier is suitable for voltage amplification. 6+2

Contd.

(b) Calculate the value of voltage gain, input resistance and output resistance for the following amplifier *(Fig 3)*

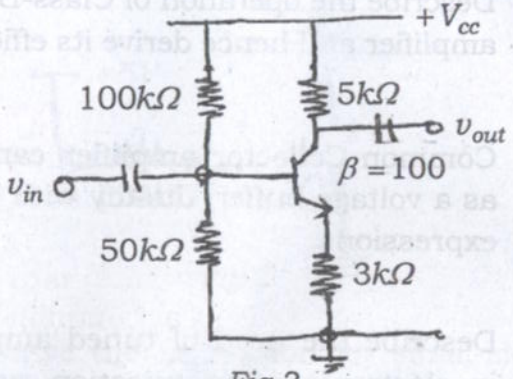

Fig.3

6. *(a)* Derive the expression for the small-signal voltage gain, input resistance and output resistance for the amplifier shown in *Fig* 4. 6+4+2

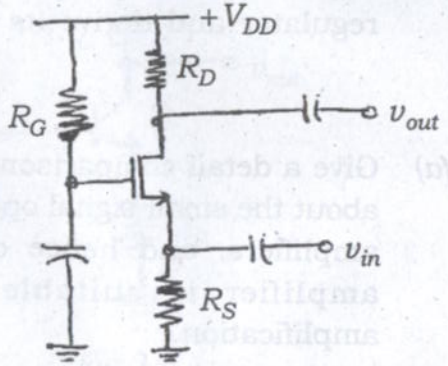

Fig.4

(b) Describe various types of coupling techniques used in designing multi-stage amplifiers and derive the expression for voltage gain of a CE-CC cascade. 4+4

7. *(a)* Why input impedance and output impedance of an amplifier are important? Prove that a common-source amplifier has more input impedance than a common emitter amplifier. 2+8

(b) Describe the operation of a Buck regulator and derive the expression for its duty cycle. 8+2