53 (EC 301) ELDC

2021

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.*

1. Explain *h*-parameter model of a transistor at low frequencies and derive the formulas for — 5×4=20

   (i) Current Gain

   (ii) Voltage Gain

   (iii) Power Gain

   (iv) Output Impedance.

2. *(a)* Describe the operation of common collector amplifier as an emitter follower. 10

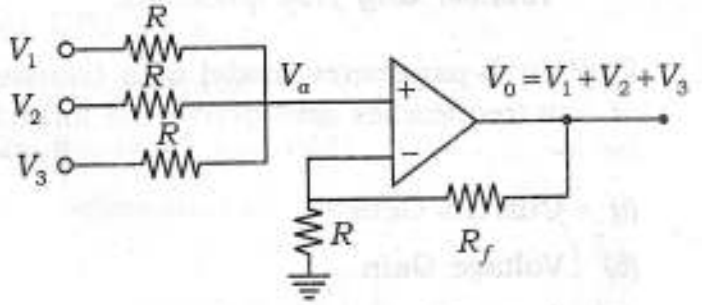
Contd.

(b) Describe the operation of shunt voltage regulator. 4

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

3. (a) Draw the inverting and non-inverting amplifier of an Op-Amp in closed loop configuration. Obtain expression for the closed loop gain in these circuits. 5+5=10

(b) Given a non-inverting summing amplifier. Find the relation between R_f and R. 10



4. (a) Explain Class A, Class B and Class C power amplifier. 6

(b) Describe a transistor Class A power amplifier with resistive load and derive maximum collector efficiency. 10

(c) Write the difference between voltage amplifier and power amplifier. 4

5. (a) What is an oscillator ? State the conditions under which a feedback amplifier works as an oscillator. 3

(b) Describe Hartley oscillator circuit and explain its action. 7

(c) A Hartley oscillator is designed with $L_1 = 2mH$, $L_2 = 20\mu H$ and a variable capacitance. Determine the range of capacitance values, if the frequency of oscillation is varied between 950 and 2050 *kHz*. 6

(d) What is the principle of phase shift oscillator ? 4

6. (a) Explain the working principle of N-channel JFET. 10

(b) Define : 4

(i) The pinch-off voltage

(ii) Channel ohmic region

(iii) Drain resistance

(iv) Transconductance.

(c) Explain MOSFET operating in enhancement mode. 6

7. Write short notes on the following : ***(any four)*** 5×4=20

(i) Single tuned amplifier

(ii) Three terminal IC regulator

(iii) Two stage RC coupled JFET amplifier

(iv) Push pull amplifier

(v) Short circuit protection for voltage regulator

(vi) Boost regulator

(vii) UPS

(viii) Multivibrator

(ix) Feedback amplifier

(x) Differentiator.