Total No. of printed pages = 8

END SEMESTER EXAMINATION – 2020

Semester : 4th

Subject Code : CAI-404

ELECTRONIC CIRCUITS AND DEVICES - I

Full Marks – 70

Time – Three hours

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

Instructions :

1. Questions of PART–A are compulsory.
2. Answer any *five* questions from PART–B.

PART – A

Marks – 25

1. Fill in the blanks : 1×10=10

   (a) The cut in voltage for Si diode is approximately _____.

   (b) Clipper circuits always _____ some part of the input signals.

   (c) In a transistor lightly doped part is _____.

[Turn over

(d) The oscillator is an amplifier with _____ feedback.

(e) In FET channel is _____ doped.

(f) An Ideal Op-Amp has _____ CMRR.

(g) The push pull amplifier is free from _____.

(h) A voltage follower has gain _____.

(i) The function of transistor is _____.

(j) The charge carriers in an N channel JFET are _____.

2. Write true or false : 1×10=10

(a) Knee voltage is defined as the forward voltage at which the current through the junction starts decreasing rapidly.

(b) The diode depletion width shrinks in forward bias which results in having a majority flow across the junction.

(c) In saturation region operation of a transistor both junctions are forward biased.

(d) Common collector arrangement is generally used for impedance matching.

(e) Power amplifier converts a part of the input DC power into AC power.

(f) A FET differs from a bipolar transistor as it has high input impedance.

(g) An Ideal Op-Amp has large bandwidth.

(h) Intermediate stage of an Op-Amp provides some additional gain.

(i) An Op-amp is a non-linear IC.

(j) Astable multivibrator has two Quasi stable state.

3. Choose the correct answer : 1×5=5

(a) The emitter of a transistor is generally doped the heaviest because it

(i) has to supply the charge carriers

(ii) has to dissipate maximum power

(iii) is the first region of the transistor

(iv) must possess low resistance

(b) In a transistor the reverse saturation current Ico

(i) Doubles for every 1^{o} C rise in temperature

(ii) Doubles for every 10^{o} C rise in temperature

(iii) Increase linearly with temperature

(iv) Decrease linearly with temperature

(c) Negative feedback reduces distortion in an amplifier only when

(i) it is part of its output

(ii) it is generated within it

(iii) it comes as a part of input signal

(iv) it exceeds a certain safe level

(d) The common mode gain is

(i) very high

(ii) very low

(iii) always unity

(iv) None of the above

(e) Oscillator must employ

(i) positive feedback

(ii) negative feedback

(iii) neither positive nor negative feedbacks

(iv) None of the above

PART – B

Marks – 45

4. (a) Discuss the behaviour of PN junction under no bias condition. 3

(b) Explain the working principle of npn transistor. 4

(c) Draw the circuit diagram of CE transistor configuration. 2

5. (a) Explain the operation of BJT as a switch. 3

(b) What do you mean by DC load line ? 1

(c) With a neat circuit diagram explain self-bias method of transistor. 5

6. (a) What is power amplifier ? Differentiate between classes A, B and C power amplifier. 1+3=4

(b) Derive the maximum collector efficiency of class A transformer coupled power amplifier. 5

7. (a) A resistor load of 4Ω is matched to the collector impedance of an amplifier by means of a transformer having turn ratio of 50:1. The amplifier uses a DC supply voltage of 12 V in the absence of input signal. When signal is present at the base, the collector voltage swings between 24V and 2 V while the collector current swings between 0.9A and 0.04 A. Determine :

(i) Collector impedance

(ii) Signal power output

(iii) DC power input and

(iv) Collector efficiency. 4

(b) Explain the operation of push pull amplifier. 5

8. (a) What is condition for sustained oscillations ? Draw the circuit diagram of a transistor Colpitt's oscillator. Explain the functions of each component. 1+5=6

(b) In a Colpitt's oscillator, the desired frequency is 500 kHz. Estimate L assuming C = 1000 pF. 3

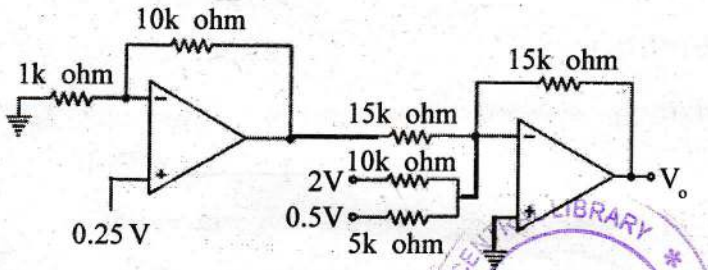
9. (a) List the ideal characteristics of an Op-amp. 4

(b) Why an Op-amp can not be used in open loop configuration for linear applications ? 2

(c) State the realistic assumptions related to an Op-amp and state their uses. 3

10. (a) Draw the circuit of non-inverting amplifier and derive the gain. 5

(b) Find the output of the following Op-amp circuit : 4



11. Explain the operation of N-channel FET and draw its characteristics. 9

12. Write short notes on any *two* :

(i) CMOS

(ii) Enhancement MOSFET

(iii) Bistable multivibrator

(iv) Feedback amplifier. 4½×2=9