Total No. of printed pages = 8

RETEST EXAMINATION–2022

Semester : 5th

Subject Code : CAI–506

ELECTRONIC CIRCUITS AND DEVICES-II

Full Marks – 70

Time – Three hours

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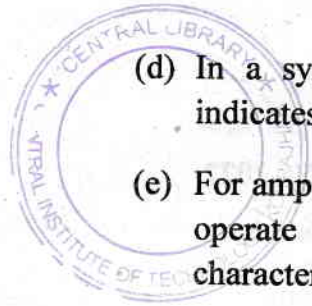for the questions.

Instructions :

(i) *All* questions of PART–A are compulsory.

(ii) Answer any *five* questions from PART–B.

PART–A

Marks–25

1 Fill in the blanks : 1×14=14

(a) A bipolar junction transistor has _____ p-n junctions and _____ terminals .

(b) The quantity □ is usually between _____ and _____ .

(c) The quantity □ provides a relationship between _____ and _____ .

[Turn over

(d) In a symbol of transistor, the arrow sign indicates _____.

(e) For amplification purpose, the transistor must operate in the _____ region of its output characteristics.

(f) When a BJT goes into saturation, both emitter and collector base junctions are _____ biased.

(g) For a transistor to operate as amplifier, the base emitter junction should be _____ biased.

(h $I_C = \alpha I_E +$ _____ .

(i) An improper biased transistor produces _____ in the output.

(j) The intersection of DC load line with the given base current curve is the _____ .

(k) Tuned amplifier used for _____ .

(l) Positive feedback is employed in _____ .

(m) Negative feedback in amplifiers reduces the gain but _____ bandwidth .

(n) A high Q coil has _____ selectivity.

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2 Write true or false :   1×9=9

   (a) The resistivity of a semiconductor depends on the atomic structure of the semiconductor.

   (b) The potential barrier in a p-n junction increases with reverse bias and reduces with forward bias.

   (c) A p-n junction is forward bias if the n side is connected to the negative terminal of a battery and the p-side is connected to the positive terminal.

   (d) If a p-n junction is heavily doped, breakdown voltage will be reduce.

   (e) Zener diode operates in the reverse bias region.

   (f) The voltage gain of a transistor increases with the increase in load resistance.

   (g) A BJT fixed bias configuration has more temperature stability than voltage divider bias.

   (h) The most commonly used transistor arrangement is common collector.

   (i) I_{co} of a transistor consists of majority carrier.

3. Choose the correct answers : $1 \times 2 = 2$

(a) A Schmitt trigger converts a slowly varying waveform into a

(i) sinewave   (ii) sawtooth wave

(iii) triangular wave (iv) square wave

(b) Oscillators used following feedback

(i) Positive

(ii) Negative

(iii) Both positive and negative

(iv) None of the above.

PART – B

Marks – 45

4. (a) Determine the expressions for I_B , I_C and V_{CE} for the following biasing circuits for a common emitter NPN transistor :
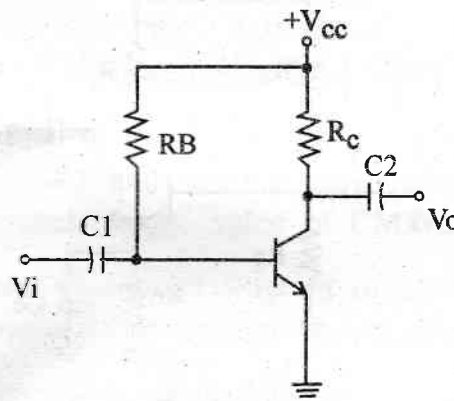
(i) Fixed Bias (ii) Emitter Bias.   6

(b) In a transistor Colpitt's oscillator, L= 100μH, C_1 = 0.001μF and C_2 = 0.05μF, determine the operating frequency of the circuit.   3

5. (a) Deduce the expressions for input impedance, output impedance and voltage gain of the following circuit using r_e model of the transistor.

Calculate gain, when $R_B = 100k\Omega$, $R_C = 1k\Omega$, $r_o = 50k\Omega$, $V_{CC} = 12V$ and $\square = 100$.   6
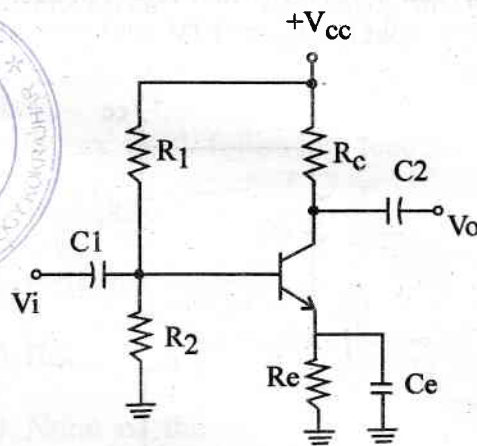

(b) What are the advantages of negative feedback in amplifiers ?   3

6. (a) For the potential divider biasing circuit shown in the figure below, draw the h-parameter equivalent circuit. Also, calculate the following :

    (i) Input impedance

    (ii) Output impedance

    (iii) Voltage gain

    (iv) Current gain

[Given : $R_1 = 10\ K\Omega$, $R_2 = 5\ K\Omega$, $R_c = 3\ K\Omega$, $R_E = 1K\Omega$, $V_{cc} = 20\ V$, $h_{ie} = 1\ K\Omega$, $h_{fe} = 100$, $h_{oe} = 20\mu A/V$, $h_{re} = 2 \times 10^{-4}$]   6

(b) Draw the circuit of a voltage supply comprised of a full wave bridge rectifier, capacitor filter and IC regulator to provide an output of +12V.   3

7   Draw the ideal structure and equivalent circuit of series shunt feedback amplifier. Determine the expression for gain, input impedance and output impedance of the amplifier.   9

8. (a) Draw the circuit diagram of Colpitt's oscillator and describe its working.   5

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(b) Draw the circuit diagram of the following :

(i) Phase Shift Oscillator

(ii) Wein Bridge Oscillator

Also write the equation for operating frequency in each case.   4

9. (a) What are the Barkhausen criteria for continuous oscillation ?   3

(b) Define the common mode rejection ratio (CMRR) and explain the significance of relatively large value of CMRR.   3

(c) Draw the circuit diagram of OPAMP half-wave rectifier and describe its operation. 3

10. (a) Draw the block diagram and circuit diagram of series voltage regulator. Describe the operation of the circuit in brief.   5

(b) Describe the working of IC LM317 with a suitable diagram.   4

11. (a) Draw the equivalent circuit diagram of Crystal Oscillator and explain its working.

                                                                    5

(b) Draw the circuit diagram of a first order active low pass filter and derive the expression for gain.   4

12. (a) Draw the circuit diagram of a tuned amplifier and explain its working. 4

(b) What are the advantages of using double tuned circuit as compared to the single tuned circuit ? 2

(c) A tuned amplifier consists of a tank circuit having $R=10\Omega$, $L=50$ mH and $C=0.1\mu F$. Determine resonant frequency of the amplifier, Q factor of the tank circuit and bandwidth of the amplifier. 3