Total No. of printed pages = 8

END SEMESTER EXAMINATION –2019

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 :

1. Questions on PART–A are compulsory.
2. 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 _____ PN junctions and _____terminals.

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

[Turn over

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

(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.

2. Write true or false : 1×9=9

(a) The resistivity of a semi-conductor depends on the atomic structure of the semi-conductor.

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

(c) A PN 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 PN junction is heavily doped, breakdown voltage will be reduced.

(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 consist of majority carrier.

3 Choose the correct answer : 1×2=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 the 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

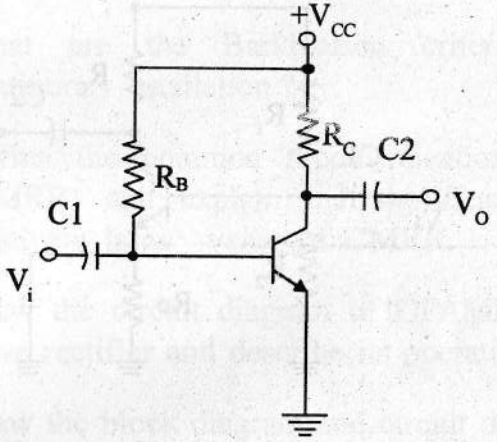
(i) Fixed bias.

(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= 100kΩ, R_C = 1kΩ, r_o= 50kΩ, V_{CC} = 12V and β = 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:

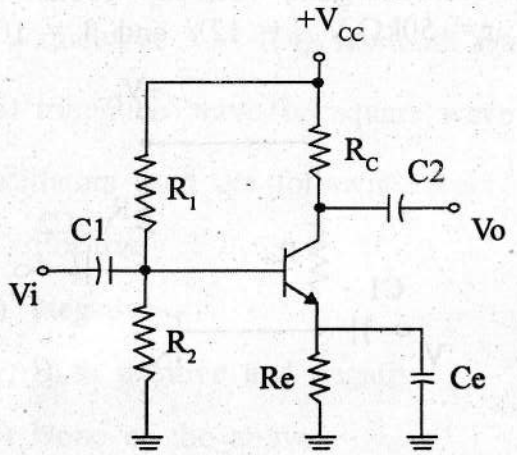
(i) Input impedance

(ii) Output impedance

(iii) Voltage gain

(iv) Current gain

[Given : R_1 =10 KΩ, R_2 = 5 KΩ, R_c = 3 KΩ, R_E = 1KΩ, V_{cc} = 20 V, h_{ie} = 1 KΩ , h_{fe} = 100, h_{oe} = 20μA/V, h_{re} = 2x 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

(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 $C=0.1$ μF. Determine resonant frequency of the amplifier, Q factor of the tank circuit and bandwidth of the amplifier. 3