Total No. of printed pages = 3

ECE 181402

Roll No. of candidate [| | | | | | | | |]

2022

B.Tech. 4ʰ Semester End-Term Examination

ANALOG CIRCUITS

(New Regulation & New Syllabus)

Full Marks – 70   Time – Three hours

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

Answer question No. 1 and any *four* from the rest.

1.   Answer the following : $(10 \times 1 = 10)$

   (i)   The f_a is proportional to the cut off frequency at which the common-lease
         short circuit small signal forward current transfer ratio A_i has dropped by
         3dB from its value at low frequency
         (a)   True   (b)   Fasle
   (ii) Du a voltage series feedback amplifier ———
         (a)   The input impedance increases but the output impedance decreases
         (b)   Both input and output impedance increases
         (c)   Both input and output impedance decrease
         (d)   The input impedance decreases but the output impedance increases
   (iii) Du a crystal oscillator the crystal is equivalent to a
         (a)   Tuned circuit with high Q
         (b)   Tuned circuit with low Q
         (c)   Any RC circuit
         (d)   Any RL circuit
   (iv) The lower cut of frequency of a two stage RC coupled amplifier is
         (a)   Higher then its value for the single stage amplifier
         (b)   Lower than its value for the single stage amplifier
         (c)   Equivalent to its value for the single stage amplifier
         (d)   It random

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(v) When SCR is conducting, the anode terminal of the SCR is always

    (a) At positive potential with respect to the cathode

    (b) At negative potential with respect to the cathode

    (c) At zero

    (d) At the same potential with the cathode

(vi) Du a class B push-pull amplifier

    (a) The transistor is biased at saturation region

    (b) The transistor is biased at cut of near cut off region

    (c) The transistor is biased at active region

    (d) The transistor is left open

(vii) The voltage that starts an oscillator is caused by the noise voltage in resistor

    (a) True   (b) False

(viii) Du a CE amplifier, the lower cut off frequency is Decided by

    (a) The emitter bypass capacitor

    (b) The coupling capacitor

    (c) The load

    (d) The base current

(ix) Du a class and amplifier

    (a) Current flows for half of the entire cycle

    (b) Current flows for the entire cycle

    (c) Current flows for less than half of the entire cycle

    (d) Current flows for more than half of the cycle but less than the entire cycle

(x) Du a negative feedback amplifier circuit

    (a) The gain can be controlled

    (b) The gain is infinite

    (c) The gain is zero

    (d) The gain is unity

2. (a) What is a trans-conductance amplifier. (2)

    (b) Discuss the working principle of a current mirror circuit, What is the need of the circuit. (8)

    (c) Derive the voltage gain of a common base amplifier circuit. (5)

3. (a) (i) Draw a circuit diagram of a two-stage RC coupled BJT amplifier. Draw the frequency response of an RC coupled amplifier. (2+2)

(ii) What is direct coupled amplifier? Write applications of a direct coupled amplifier. (2)

(b) (i) Draw the circuit diagram of a class A amplifier and explain its operation briefly. (2+3)

(ii) Derive the equation for efficiency of a class A amplifier. (4)

4. (a) (i) In a voltage- series feedback amplifier A=400, Ri=3 KΩ, R₆=100 K₀ and $\beta=0.1$. Determine overall gain, input impedance, and output impedance of feedback amplifier. (3)

(ii) Calculate the overall loop gain, input and output impedances for an amplifier in a current series feedback amplifier with A=100, R₁=10 KΩ, R₆=50 KΩ and $\beta=0.025$. (2)

(b) A class B push-pull power amplifier is supplied with Vcc=50 V. The signal swings the collector voltage down to V_{min} of 5v. The total dissipation in both transistor is 40 W. Find the

(i) Total power (ii) Conversion efficiency (5+5=10)

5. (a) Draw the circuit diagram of a differential amplifier and derive the gain of the circuit. What is the advantages of a differential amplifier over single stage (10)

(b) What is CMRR? Discuss its significance. (5)

6. (a) An R-C coupled amplifier has mid-frequency gain of 200 and a frequency response from 100 Hz to 20 kHz. A negative feedback network with $\beta=0.2$ is incorporated into the amplifier circuit. Find the bandwith after feedback. (4)

(b) What is Barkhausen criterion? Explain the working of Hartley oscillator with neat diagram. (5)

(c) In a Hartley oscillator circuit C=500pf, L1 =20mH and L2=5mH. Find

(i) frequency of oscillation

(ii) sketch Hartley oscillator circuit using BJT. (6)

7. (a) List three advantages and disadvantages of active filter over passive a filters. (3)

(b) List the characteristics of an ideal OPAMP. (4)

(c) Describe a log amplifier using OPAMP and show the output is proportional to logarithm of the input voltage. (8)