Register No.: …… Name: ……

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

THIRD SEMESTER B.TECH DEGREE EXAMINATION (S), MAY 2022

ELECTRICAL AND ELECTRONICS ENGINEERING
(2020 SCHEME)

Course Code: **20EET205**

Course Name: **Analog Electronics**

Max. Marks: **100** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. What factors are to be considered for selecting the operating point Q for an amplifier?
2. Explain any compensation technique adopted in the transistor amplifier for reducing the drift of the operating point.
3. Draw and explain high frequency hybrid π model of common emitter transistor.
4. Explain the construction and operation of enhancement type MOSFET with neat diagrams.
5. State Barkhausen criteria for sinusoidal oscillators.
6. List the characteristics of an amplifier that get modified by negative feedback.
7. Design an op-amp circuit to get output as $V_o = V_1 + V_2 - V_3 - V_4$, where V_1, V_2, V_3 and V_4 are inputs to the op-amp.
8. Explain the operation of a square waveform generator using an op-amp.
9. What are the limitations of an ideal integrator? Design a circuit which overcomes the errors of an ideal integrator.
10. Explain the ramp wave generators using op-amp.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Design a voltage divider bias circuit to operate from a 18V supply in which bias conditions are to be $V_{CE} = V_E = 6$ V and $I_C = 1.5$ mA. $\beta = 90$. Also calculate the stability factor S. (7)

    b) Draw the h parameter model of a transistor in CE configuration. Also derive the expression for input impedance, current gain and voltage gain. (7)

OR

12. a) A CE amplifier has the h-parameters given by $h_{ie} = 1000\Omega$, $h_{re} = 10*10^{-4}$, $h_{fe} = 50$, $h_{0e} = 100\ \mu\Omega^{-1}$. If the load resistance is 1kΩ, determine the a) current gain and b) voltage gain c) input impedance. (8)

b) With neat diagrams, explain the DC load line in a transistor and significance of Q point. (6)

MODULE II

13. a) Draw a common drain JFET amplifier. Using small signal equivalent circuit derive the expression of the voltage gain. (7)

b) Explain the biasing, operation and characteristics of JFET. (7)

OR

14. a) How does the constructional feature of MOSFET differ from that of JFET? (10)

b) A JFET has the following parameters: $I_{DSS} = 32$ mA ; V_{GS} (off) = – 8V ; V_{GS} = –4.5 V. Find the value of drain current. Determine transconductance g_m at this drain current. (4)

MODULE III

15. a) An amplifier with negative feedback has a voltage gain of 100. It is found that without feedback an input signal of 50mV is required to produce a given output, whereas with feedback, the input signal must be 0.6V for the same output. Calculate the value of amplifier gain A and feedback factor β. (6)

b) Derive the equation for power output and conversion efficiency of a class A series fed amplifier. (8)

OR

16. a) Draw the circuit of a Two Stage RC-Coupled amplifier and explain its working and advantages. (7)

b) For a class B power amplifier using a supply of V_{cc} =30V and driving a load of 16Ω, Determine maximum load power. DC input power and collector efficiency. (7)

MODULE IV

17. a) Derive the expression for voltage gain of a dual input balanced output differential amplifier. (7)

b) A differential amplifier has a gain of 100. A common input of 5mV is applied to both terminals, which result in an output voltage of 18mV. Determine i) common mode gain ii) CMRR. If the input signals are changed to 50mV and 100mV with 1mV of noise on each input. Find iii) the output signal iv) the noise on the output. (7)

OR

18. a) Define the following terms
i) CMRR ii) Slew rate iii) Input bias current (6)

b) What are the advantages and features of an instrumentation amplifier? Derive the expression for output voltage of instrumentation amplifier. (8)

MODULE V

19. a) Draw and explain the circuit of IC 555 in Monostable mode with relevant waveforms. (7)

    b) Draw and explain the operation of a Triangular waveform generator using op amp. (7)

OR

20. a) Explain inverting Schmitt trigger circuit with relevant waveforms. (7)

    b) Draw the circuit diagram of an astable-multivibrator using 555 timer to generate the output signal with frequency 2 kHz and duty cycle of 75%. (7)

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