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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B. TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: EE203

Course Name: ANALOG ELECTRONIC CIRCUITS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

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| 1 | Design a clamper circuit using diode to obtain sine wave output with its negative peak clamped to +2.6V. (Assume diode drop as 0.6V). | (5) |
| 2 | Why does the gain of a transistor amplifier vary with frequency? Sketch the frequency response of CE amplifier. | (5) |
| 3 | Why negative feedback is utilised in amplifiers? How various parameters of an amplifier gets modified by negative feedback? | (5) |
| 4 | The gain bandwidth product of an op-amp is given as 10MHz. Determine the bandwidth of a non inverting amplifier using op amp for a gain of 60dB. Also find the closed loop gain of the amplifier if the required bandwidth is 100kHz. | (5) |
| 5 | Draw the circuit diagram of an ideal differentiator using op-amp with corresponding input and output waveform. Why the circuit can not be recommended for practical use? | (5) |
| 6 | Design a comparator using Op Amp that compares a sinusoidal signal of 3V peak with a fixed dc voltage of 1.5V. Draw corresponding waveforms. | (5) |
| 7 | Design a Wein bridge oscillator with frequency of oscillation of 1kHz using op-amp. | (5) |
| 8 | Draw a monostable multivibrator circuit for a time period of 1msec with an amplitude of 10V using 555 timer. | (5) |

PART B

Answer any two full questions, each carries 10 marks.

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| 9 | a) Explain the construction and operation of Enhancement type MOSFET with neat diagrams. | (5) |
| | b) Design a zener voltage regulator to provide regulated output voltage of 5.6 V for a variable load resistance that varies from 300Ω to 6kΩ. Zener diode parameters are $I_{Zmin} = 0.25 \text{ mA}$ and $P_Z = 280 \text{ mW}$. The input voltage is considered as constant at 15V. | (5) |
| 10 | a) The data sheet of N channel JFET gives the following details. $I_{DSS} = 10 \text{ mA}$ and pinch off voltage of -4.8V. Determine (i) V_{GS} corresponding to drain current of 3.5 mA. (ii) Determine transconductance g_m at this drain current. | (5) |
| | b) Draw the small signal AC equivalent circuit of a Common Drain FET amplifier. Derive the expression for voltage gain, input impedance and output impedance. | (5) |
| 11 | a) Determine the following parameters for the fixed bias configuration of transistor amplifier. (i) I_B and I_C (ii) V_{CE} and (iii) V_B and V_C . Assume $V_{BE} = 0.7 \text{ V}$. | (4) |

Given $\beta=100, V_{cc}=16V, R_c=2.2k\Omega$ and $R_B=240 k\Omega$.

- b) Design a voltage divider bias circuit to obtain the following specifications and determine the stability factor. Assume the ratio of base current to the current through R_{B2} is 1:10. Given $V_{CC}=22V, \beta=100, V_{CE}=50\%$ of $V_{CC}, V_{RE} = 10\%$ of $V_{CC}, I_C=0.8mA$ and $V_{BE}=0.7V$. (6)

PART C

Answer any two full questions, each carries 10 marks.

- 12 a) Specify different schemes of coupling in multistage amplifiers. Compare their merits and demerits (5)
- b) Why class AB power amplifiers are preferred over Class B operations? (5)
- 13 a) Derive the expression for frequency of oscillation for RC phase shift oscillator using BJT. (5)
- b) The datasheet of Op Amp gives the following values. (5)
Open loop Gain= 175,000, common-mode gain =0.18 and slew rate= 0.5V/ μ s. Determine the CMRR in decibels. How long does it take the output voltage of an op-amp to go from -10V to +10V?
- 14 a) Derive the expression for output power and conversion efficiency of class B push pull power amplifier. (5)
- b) How do the open-loop voltage gain and closed-loop voltage gain of an op-amp differ? What is the limiting value of output voltage of Op Amp Circuit? Justify with proper characteristics. (5)

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Design an Op Amp circuit to get the output according to the given expression. (5)
 $V_O = -[0.3V_1 + 3V_2 + V_3]$ where V_1, V_2 and V_3 are the inputs to op-amp.
- b) Analyze the circuit diagram of an Instrumentation amplifier using op-amp. Derive the expression for output voltage. (5)
- 16 a) Draw and explain the operation of a triangular wave generator using op-amp. (5)
- b) Design an astable multi vibrator using 555 timer for an output wave of 60% duty ratio at 2kHz frequency. (5)
- 17 a) Draw the circuit diagram of a Precision rectifier using op-amp. What is the main advantage over a normal rectifier? (5)
- b) Design an RC phase shift oscillator using op-amp for an output frequency of 1kHz (5)
