**C** **B3C045** **Total Pages:4**

Reg. No. _____ Name_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

THIRD SEMESTER B.TECH DEGREE EXAMINATION, JANUARY 2017

Course Code**: EE 203**

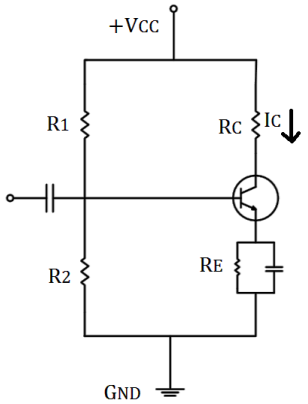
Course Name**: ANALOG ELECTRONIC CIRCUITS (EE)**

Max. Marks: 100 Duration: 3 Hours

## PART A

***Answer all questions. Each question carries 5 marks.***

1. Draw the dc and ac load lines for the transistor circuit. Given $R_1$=18KΩ, $R_2$=8.2KΩ, $R_C$=2.2KΩ, $V_{cc}$ =20V, $R_E$=2.7KΩ.



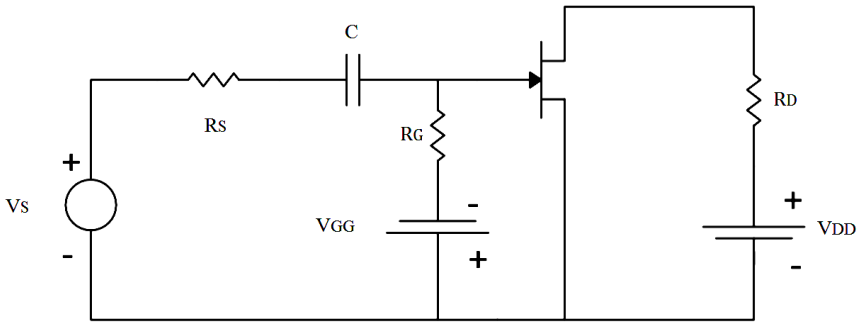

2. Why does gain of amplifier falls off at low and high frequencies?
3. List the characteristics of an amplifier that get modified by negative feedback.
4. a) What are the modes in which an op-amp can be operated?

   b) An op-amp has a gain bandwidth product of 15 MHz. Determine the bandwidth of op-amp when $A_{cL}$ =500. Also find maximum value of $A_{CL}$ when frequency is 200 KHz.
5. Design an adder circuit to get the output expression as $V_o = -[0.1\ V_1 + V_2 + 10\ V_3]$ where $V_1$, $V_2$ and $V_3$ are the inputs to the Op-amps.
6. What are the limitations of an ideal integrator? Design a circuit which overcome the errors of ideal integrator.
7. Distinguish between triangular wave and ramp generator using op-amp.
8. Design a phase shift oscillator with a frequency of 100 Hz using op-amp.

## PART B

***Answer any 2 questions. Each question carries 10 marks.***

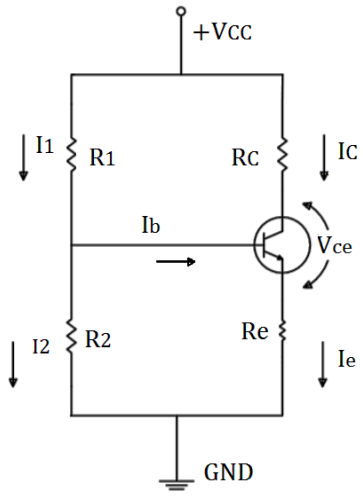
9. a) Parameters of FET used in amplifier circuits are $g_m$=4.2 m℧ and $r_d$=30KΩ. Assume C to be short circuit for signal frequency, given a small signal model for the amplifier. Determine small signal voltage gain if $R_D$ =6.8KΩ, $R_G$ = 1MΩ and $R_S$=10 KΩ.




(2.5)

b) Compare JFET with MOSFET. (2.5)

c) Why is voltage divider bias relatively stable against changes in $h_{fe}$? ii) Design voltage divider bias circuit to operate from a 12V supply. The bias conditions are $V_{CE}$=3V,$V_E$=5V and $I_c$=1mA. (5)




10. a) A transistor used in CE connection has the following set of h parameters when the d.c. operating point is $V_{CE}$ =5V and $I_C$ = 1 mA; $h_{ie}$ =1700 Ω ; $h_{re}$ =1.3 ×10-4; $h_{fe}$ = 38; $h_{oe}$ = 6 × $10^{-6}$ ℧. If the a.c. load $r_L$ seen by the transistor is 2 KΩ , find (i) the input impedance (ii) current gain (iii) voltage gain (5)

b) Why the gate junction of FET is always reverse biased? List the parameters of JFET from characteristics. (5)

11. a) Explain any compensation technique adopted in transistor amplifier for reducing the drift of operating point. (5)

b) The datasheet of an N-channel JFET gives the following details $I_{Dss}$ = 9 mA and pinch off voltage of -4.5V i) At what value of $V_{GS}$ will $I_D$ be equal to 3 mA?
ii) What is its $g_m$ at this $I_D$? (5)

## PART C

***Answer any 2 questions. Each question carries 10 marks.***

12. a) A differential amplifier has inputs $V_{S1}$ =10mV and $V_{S2}$= 9mV. It has differential mode gain of 60 dB and a CMRR of 80 dB. Find the percentage error in output and error voltage**.** (2)

b) State the Barkhausen criterion for sinusoidal oscillators and why this must be fulfilled to sustain oscillations? (3)

c) For a class B power amplifier using a supply of Vcc =12V and driving a load of 8Ω, Determine maximum load power. DC input power and collector efficiency. (5)

13. 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 same output. Calculate the value of *A* and β. (5)

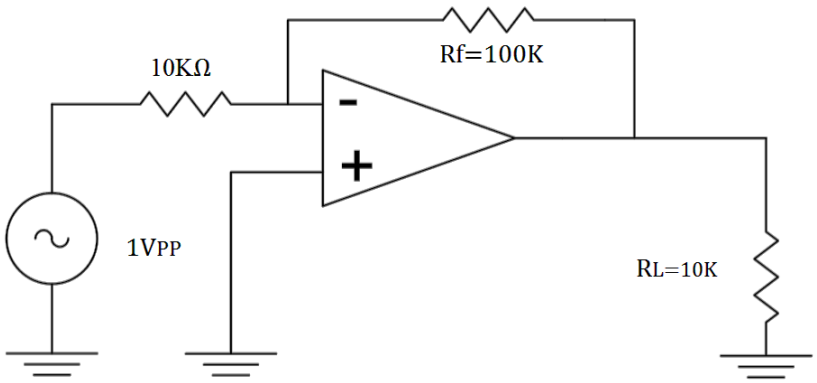
b) Show how piezo-electric crystals are employed for oscillator stabilization. (3)

c) A crystal has the following parameters L = 0.33H,$C_1$ = 0.065pF,$C_2$ = 1.0pF and R=5.5KΩ. Determine series resonant frequency and Q factor of the crystal. (2)

14. a) Compare the merits and demerits of different types of inter stage coupling in amplifiers (3)

b) What is cross over distortion? Why most power amplifiers used in practice are designed to operate in class AB stage? (2)

c) An inverting op-amp with slew rate 0.5V/μsec is shown in the figure. Determine i) closed loop voltage gain ii) input impedance of the circuit iii) Maximum operating frequency




(5)

## PART D

**Answer any 2 questions. Each question carries 10 marks.**

15. a) 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 %. (5)

    b) What are the advantages and features of instrumentation amplifier? Derive the expression for output voltage of instrumentation amplifier**.** (5)

16. a) Design a Wein bridge oscillator circuit to produce a 100KHz, ± 9Voutput. Design amplifier to have closed loop gain of 3. (5)

    b) What is the function of precision rectifier circuits? What is the significance of UTP and LTP in Schmitt trigger circuits? (5)

17. a) Discuss how logarithmic amplifier is realized with op-amp circuitry. (5)

    b) What is the basic principle of RC oscillators? Design a phase shift oscillator to oscillate at 500Hz. (5)

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Reg. No._____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

THIRD SEMESTER B.TECH DEGREE EXAMINATION, JULY 2017

Course Code**: EE203**

Course Name**: ANALOG ELECTRONIC CIRCUITS (EE)**

Max. Marks: 100 Duration: 3 Hours

**PART A**

***Answer all Questions, each having 5 marks.***

1. Sketch a combinational clipper circuit. Explain its working.
2. Explain the drain characteristics of JFET and mark the pinch-off voltage.
3. Differentiate between positive and negative feedback. Explain how does the negative feedback modify the gain of an amplifier.
4. Explain the Barkhausen Criteria of oscillations.
5. What is a zero crossing detector?
6. An inverting amplifier using the 741 IC must have a flat response up to 40KHZ. The gain of the amplifier is 10. What maximum peak to peak input signal can be applied without distorting the output?
7. Explain the operation of a triangular wave generator.
8. Design a phase shift oscillator so that $f_o$=200 Hz.

**PART B**

***Answer any two questions, each having 10 marks.***

9. a. What factors are to be considered for selecting the operating point Q for an amplifier? (5)

   b. Draw a voltage divider bias circuit and derive the equations of voltage and current at input and output terminals. (5)

10. a. Derive the equation for voltage gain and current gain for a BJT using approximate h-parameter model for Common Emitter configuration. (6)

    b. A CE amplifier has the h-parameters given by $h_{ie} = 1000\Omega$, $h_{re} = 2 \times 10^{-4}$, $h_{fe} = 50$, $h_{oe} = 25\mu\mho$. If both the load and source resistances are 1k Ω, determine the (a) current gain and (b) voltage gain. (4)

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

## PART C

***Answer any two questions, each having 10 marks.***

12. Draw the circuit of a Two Stage RC- Coupled amplifier and explain its working and advantages.
13. Derive the equation for power output and conversion efficiency of a class Aseries fed amplifier.
14. Write short notes on the following: (2.5 marks each)
    a) CMRR
    b) Slew rate
    c) Common mode gain
    d) Differential mode gain

## PART D

***Answer any 2 questions, each having 10 marks.***

15. Draw the inverting and non-inverting amplifier circuits of an OP-AMP in closed –loop configuration. Obtain the expressions for the closed loop gain in these circuits.
16. With the help of internal functional diagram, explain how a monostable multivibrator works with use of 555 timer.
17. Draw the circuit of a Half Wave Precision Rectifier circuit and Explain its operation.

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**Total Pages: 2**

Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

THIRD SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

**Course Code: EE203**

**Course Name: ANALOG ELECTRONICS CIRCUITS (EE)**

Max. Marks: 100 Duration: 3 Hours

**PART A**

***Answer all questions, each carries 5 marks.*** Marks

1 With a neat circuit diagram explain the working of a negative voltage clamping circuit. Also sketch the output waveform for ±5V square wave input. (5)

2 Explain the construction and operation of Enhancement type metal oxide semiconductor FET with neat diagrams. (5)

3 In an amplifier open loop gain changes by ±50% using a series voltage negative feedback. The amplifier is to be modified toget a gain of 100 with ±0.1% variation. Find the required open loop gain of the amplifier and the amount of negative feedback. (5)

4 Explain Barkhausen criteria of sustained oscillation (5)

5 Derive the expression for voltage gain of a non-inverting amplifier. (5)

6 Design a three input summing amplifier using op-amp having gains of 2,3and 5 respectively for each input. (5)

7 Define slew rate and explain its effect on waveform generation. (5)

8 Design a phase shift oscillator to have 1.5kHz output frequency using a 741 op-amp with Vcc = ±12 V. (5)

**PART B**

***Answer any two full questions, each carries 10 marks.***

9 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. (10)

10 a) Draw a common source FET amplifier. Using small signal equivalent circuit derive the expression of the voltage gain. (6)

b) Explain the reasons for reduction of gain at high frequencies of a CE amplifier. (4)

11 a) Explain the operation of a Zener voltage regulator with a neat circuit diagram. (5)

b) Define Miller's theorem. (2)

c) In a CE amplifier circuit, $h_{fe}$ =50, $h_{ie}$ =1.3kΩ, $C_{bc}$= 5pF, $R_C$ =3kΩ, $R_{L=}$ 2.2 kΩ Calculate the Miller capacitance. (3)

**PART C**

***Answer any two full questions, each carries 10 marks.***

12 a) Draw the circuit diagrams of two stage RC coupled and Transformer coupled amplifiers. Discuss the important features and applications of both. (6)

| | | | |
|---|---|---|---|
| | b) | A transformer coupled classA power amplifier draws a current of 250mA from a collector supply of 13 V. When no signal is applied to it determine i) Maximum output power ii) Power rating of the transistor iii) Maximum collector efficiency. | (4) |
| 13 | a) | With a neat diagram explain the working of a Hartley oscillator. | (8) |
| | b) | A Wien bridge oscillator has the following components $R_1 = R_2 = R_4 = 5.6$ kΩ, $R_3 = 12$ kΩ and $C_1 = C_2 = 2000$pF. Calculate the oscillating frequency. | (2) |
| 14 | a) | Derive the expression for voltage gain of a dual input balanced output differential amplifier. | (7) |
| | b) | Why open loop op amp configurations are not used for linear applications? | (3) |

**PART D**

***Answer any two full questions, each carries 10 marks.***

| | | | |
|---|---|---|---|
| 15 | a) | Draw and explain the operation of a square waveform generator using opamp. | (5) |
| | b) | Explain inverting Schmitt trigger circuit with relevant waveforms. | (5) |
| 16 | a) | Draw and explain the circuit of IC 555 in Monostable mode with relevant waveforms. | (7) |
| | b) | What are the advantages of crystal oscillators. | (3) |
| 17 | a) | Explain the working of Instrumentation amplifier with a neat diagram. | (6) |
| | b) | In an astable multivibrator using 555, $R_B = 750$ Ω. Determine the values of $R_A$ and C to generate a 1.0 MHz clock that has a duty cycle of 25%. | (4) |

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Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

THIRD SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

**Course Code: EE203**

**Course Name: ANALOG ELECTRONIC CIRCUITS (EE)**

Max. Marks: 100 Duration: 3 Hours

## PART A

***Answer all questions, each carries 5 marks***

| | | | Marks |
|---|---|---|---|
| 1 | (a) | Design a suitable circuit to obtain the output level clipped at +3V and -4V for a 10V peak to peak sinusoidal input voltage. | (3) |
| | (b) | What are the factors affecting stability of operating point of a transistor? | (2) |
| 2 | | Draw and explain high frequency hybrid pi model of common emitter transistor. | (5) |
| 3 | | What are the different topologies of feedback amplifiers? | (5) |
| 4 | (a) | What are the properties of an ideal opamp? | (3) |
| | (b) | State Barkhausen criteria for sinusoidal oscillators. | (2) |
| 5 | | With the help of a circuit diagram show how an opamp is used to get an 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 opamp. | (5) |
| 6 | | Design anintegrator that can integrate a square wave of peak to peak voltage 10V and frequency 1 kHz and draw the output waveform. | (5) |
| 7 | | Explain the operation of a square waveform generator using opamp. | (5) |
| 8 | | Design a Wein bridge oscillator to generate a sinusoidal waveform of 1 kHz. | (5) |

## PART B

***Answer any two full questions, each carries 10 marks***

| | | | |
|---|---|---|---|
| 9 | (a) | Design a voltage divider bias circuit for a NPN transistor with $h_{fe}$ = 100 and $V_{BE}$= 0.6 V,to operate from a 12 V dc supply. The bias conditions are $V_{CE}$= 6V, $V_E$=1.2V and $I_C$ =2 mA. | (5) |
| | (b) | Explain any one compensation technique used for reducing the drift of operating point. | (5) |
| 10 | (a) | Draw the h parameter model of a transistor in CE configuration. Also derive the expression for input impedance, current gain and voltage gain. | (5) |
| | (b) | h-parameters of a transistor connected in CE configuration is $h_{ie}$ =1000 Ω,$h_{re}$= 10 $\times 10^{-4}$; $h_{fe}$= 50; hoe= 100 × 10 $^{-6}$℧. If the load resistance $R_L$is 1 KΩ , find: i) The input impedance ii) Current gain iii) Voltage gain | (5) |
| 11 | (a) | Explain the working and characteristics of a N channel MOSFET. | (6) |
| | (b) | Draw the frequency response of an amplifier. What is the significance of gain bandwidth product? | (4) |

## PART C

***Answer any two full questions, each carries 10 marks***

| | | | |
|---|---|---|---|
| 12 | (a) | What is harmonics distortion in power amplifier? Discuss the operation of a class | ( 6) |

B power amplifier and derive its maximum power conversion efficiency.

(b) Explain the working of a two stage RC coupled amplifier with circuit diagram. (4)

13 (a) Derive the expression for the voltage gain of an opamp based non-inverting amplifier. (5)

(b) Derive the frequency of oscillation of a RC phase shift oscillator using transistor. (5)

14 (a) Write short notes on the following: (4)
i) CMRR ii) Slew rate

(b) Explain the operation of Hartley oscillator with a circuit diagram. (6)

## PART D

***Answer any two full questions, each carries 10 marks***

15 (a) Draw and explain the operation of logarithmic amplifier. (5)

(b) What is the significance of UTP and LTP in Schmitt trigger circuits? Why is it called as regenerative comparator? (5)

16 (a) What are the features of instrumentation amplifier? Derive the expression for output voltage of an instrumentation amplifier. (5)

(b) Draw and explain the operation of a Triangular waveform generator using opamp (5)

17 (a) With the help of internal circuit diagram of IC555 explain the operation of a monostable multivibator. (5)

(b) Design an astable multivibrator using 555 timer to generate an output signal with frequency 5kHz and 50% duty cycle. (5)

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Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

THIRD SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

**Course Code: EE203**

**Course Name: ANALOG ELECTRONICS CIRCUITS**

Max. Marks: 100 Duration: 3 Hours

**PART A**

***Answer all questions, each carries5 marks.*** Marks

1 Draw the circuit of a simple zener voltage regulator and design thevalue ofseries resistor $R_S$ for a load voltage of 12V. Given $R_L$= 500 Ω, $I_{zmax}$= 80 mA, $I_{zmin}$ = 10 mA,$V_{inmin}$= 15V, $V_{inmax}$ =18 V. (5)

2 Draw the frequency response characteristics of RC coupled amplifier and explain the reasons behind its shape. (5)

3 List out the merits and demerits of negative feedback on amplifier performance (5)

4 Compare the characteristics of ideal Op-Amps and practical Op-Amps. (5)

5 Draw the circuit of an inverting amplifier and obtain the expression for its closed loop gain. (5)

6 Draw the Schmitt trigger circuit and determine the threshold voltages $V_{UT}$ and $V_{LT}$in a circuit with two resistors 18kΩ and 1kΩ,$V_{ref}$ = 4V, and saturation voltage = ±15V (5)

7 With necessary diagrams explain the operation of OP-Amp square wave generator. (5)

8 Explain the operation of Op-Amp crystal oscillator. (5)

**PART B**

***Answer any two full questions, each carries 10 marks.***

9 a) Draw and explain the h parameter small signal low frequency model for BJT. (4 )

b) Derive the expressions for current gain, input impedance, voltage gain and output impedance using h parameters of BJT. (6 )

10 a) Draw and explain small signal model of FET. (4 )

b) Obtain the operating point set by the voltage divider bias circuit for an NPN CE transistor with β = 50 and $V_{BE}$ = 0.7 V. Given $V_{CC}$ = 18 V, $R_1$ = 82kΩ, $R_2$ = 22kΩ, $R_C$ = 5.6kΩ and $R_E$ = 1.2kΩ. (6)

11 Explain the construction, biasing, operation and characteristics of JFET. (10)

## PART C

***Answer any twofull questions, each carries10 marks.***

12 a) With necessary diagrams explain the working of class A transformer coupled amplifier and obtain the maximum overall efficiency. (8)

b) What are its advantages and disadvantages (2)

13 a) Compare different types of multistage amplifiers. (5)

b) With a neat circuit diagram explain the operation of Colpitt's oscillator using BJT. (5)

14 a) Define the following terms (8)

i) CMRR ii) Slew rate iii) Input bias current (iv) Input offset voltage

b) Give the typical values of above parameters for 741 IC (2)

## PART D

***Answer any twofull questions, each carries 10 marks.***

15 a) Explain the operation of Op-Amp integrator and differentiator circuits. (6)

b) Explain the working and design of a triangular wave generator circuit with necessary diagrams. (4)

16 a) What are the features of instrumentation amplifier? Derive the expression for output voltage of an instrumentation amplifier. (6)

b) Design the feedback circuit of a Wein Bridge oscillator with 2MHz output frequency. (4)

17 With the help of internal circuit diagram of IC555 explain the operation of astable multivibrator.Derive the expression for frequency of oscillation. (10)

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Reg No.:_____ Name:_____

**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 carries5 marks.*** Marks

| | | | |
|---|---|---|---|
| 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 twofull questions, each carries10 marks.***

| | | | |
|---|---|---|---|
| 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 mA and $P_Z$= 280mW .The input voltage is considered as constant at 15V. | (5) |
| 10 | a) | The data sheet of N channel JFET gives the following details. $I_{DSS}$=10mA 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 $V_{BE}$=0.7V. | (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 carries10 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/μs. 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 twofull questions, each carries 10 marks.***

15 a) Design an Op Amp circuit to get the output according to the given expression. (5)
$V_O$ =-[0.3$V_1$+3$V_2$+$V_3$] 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)

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Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

THIRD SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

**Course Code: EE203**

**Course Name: ANALOG ELECTRONICS CIRCUITS**

Max. Marks: 100 Duration: 3 Hours

**PART A**

***Answer all questions, each carries5 marks.*** Marks

| | | | |
|---|---|---|---|
| 1 | | Design a clamper circuit to create a dc offset of -3V to a sine wave input of amplitude 5V also draw the output waveform | (5) |
| 2 | | Draw the frequency response of CE amplifier and explain why gain falls at very high frequencies & very low frequencies. | (5) |
| 3 | | What is the concept of negative feedback in amplifiers? List out the advantages of negative feedback in amplifiers. | (5) |
| 4 | | Show that the closed loop gain of opamp amplifier can be made independent of its open loop gain. | (5) |
| 5 | | Draw the circuit diagram of a Schmitt trigger. Why it is called as a regenerative comparator? | (5) |
| 6 | | Explain with neat circuit diagram, the operation of Logarithmic amplifier | (5) |
| 7 | | How triangular wave can be generated using opamps? | (5) |
| 8 | | Determine the output frequency of the 555 astable multivibrator for C=0.01μF, $R_A$=2kΩ & $R_B$=200kΩ. | (5) |

**PART B**

***Answer any twofull questions, each carries10 marks.***

| | | | |
|---|---|---|---|
| 9 | | Design a Voltage divider circuit for a silicon transistor with $h_{fe}$=100 and S≤8. The desired Q-point is $V_{CE}$=5V, $I_C$=1mA. Assume $V_{CC}$=10V and $R_E$=1kΩ | (10) |
| 10 | | Explain using neat sketches, the operation & characteristics of a n-channel JFET. | (10) |
| 11 | a) | Illustrate with neat circuit diagram how the change in base emitter voltage is compensated in transistor amplifiers | (5) |
| | b) | Draw the Hybrid-π model of BJT and explain significance of each parameters. | (5) |

**PART C**

***Answer any twofull questions, each carries10 marks.***

| | | | |
|---|---|---|---|
| 12 | | Show that the maximum conversion efficiency of class A power amplifier can be increased using transformer coupling. | (10) |
| 13 | | Draw the neat circuit diagram of RC phase shift oscillator and derive its | (10) |

frequency of oscillations

14 a) List out the advantages and disadvantages of a transformer coupled multistage amplifier. (5)

b) How CMRR and Slew rate influence the performance of an opamp? (5)

## PART D

***Answer any twofull questions, each carries 10 marks.***

15 With neat circuit diagram, explain the operation of an Instrumentation amplifier and derive an expression for its voltage gain. What are its advantages? (10)

16 Draw the internal circuit diagram of 555 IC and explain its operation as astable multivibrator. (10)

17 a) Explain the working of half wave precision rectifier using neat circuit diagram (5)

b) With neat circuit diagram explain the operation of Wien bridge oscillator using opamp. (5)

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Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Third semester B.Tech examinations (S) September 2020

**Course Code: EE203**

**Course Name: ANALOG ELECTRONICS CIRCUITS**

Max. Marks: 100 Duration: 3 Hours

**PART A**

***Answer all questions, each carries 5 marks.*** Marks

| | | | |
|---|---|---|---|
| 1 | | Sketch the circuit of a biased positive clamper with a biasing voltage of +2V for a ±10V square wave input. Also plot its output voltage waveform and explain its operation. | (5) |
| 2 | | State and explain Miller's theorem. | (5) |
| 3 | | An amplifier having an input resistance 4kΩ has a voltage gain of 200. If a series negative feedback with β=0.01 is introduced, determine the value of input resistance of the feedback amplifier. If the amplifier in its open loop configuration had cut off frequencies $f_1$= 2kHz and $f_2$= 500kHz before the feedback path was added, what is the new bandwidth of the circuit? | (5) |
| 4 | | Why op-amp is not used in open loop for most of the applications? | (5) |
| 5 | | Deduce the expression for closed loop voltage gain of non-inverting amplifier. | (5) |
| 6 | | Explain the operation of an op-amp comparator with circuit diagram and waveforms | (5) |
| 7 | | Explain the operation of op-amp based crystal oscillator. Mention its advantage. | (5) |
| 8 | | Design a Wien Bridge oscillator circuit using op-amp having an oscillating frequency of 10kHz. | (5) |

**PART B**

***Answer any two full questions, each carries 10 marks.***

| | | | |
|---|---|---|---|
| 9 | a) | Explain the operation of a two level clipper circuit. | (5) |
| | b) | Determine the minimum and maximum possible values of series resistance Rs of a zener voltage regulator circuit feeding a 1kΩ load from a supply voltage of 20V. Maximum value of zener current is 40mA and zener voltage is 10V. | (5) |
| 10 | a) | With the help of a neat diagram, explain the small signal model of FET. | (4) |

| | | | |
|---|---|---|---|
| | b) | Derive the expression for output impedance and voltage gain of a Common Source JFET Amplifier. | (6) |
| 11 | a) | Draw the circuit of a BJT in potential divider bias configuration. Derive the expression for Q point voltage and current. | (5) |
| | b) | Explain the high frequency hybrid pi model of a common emitter transistor. | (5) |

## PART C

***Answer any two full questions, each carries 10 marks.***

| | | | |
|---|---|---|---|
| 12 | a) | Explain the concept of virtual short in op-amps. | (5) |
| | b) | Draw the circuit diagram of Colpitt's Oscillator and explain its principle of operation. | (5) |
| 13 | a) | What is the concept of negative feedback and draw the schematic diagrams of four basic negative feedback configurations. | (5) |
| | b) | What is class A operation and derive the expression for conversion efficiency of a transformer coupled class A power amplifier. | (5) |
| 14 | a) | Draw the circuit diagram of a two stage direct coupled transistor amplifier. Mention its advantages and application. | (5) |
| | b) | Derive the expression for frequency of oscillation of a wien bridge oscillator using BJT. | (5) |

## PART D

***Answer any two full questions, each carries 10 marks.***

| | | | |
|---|---|---|---|
| 15 | a) | Analyse the operation of a precision rectifier using op-amp using circuit diagram and waveforms. | (5) |
| | b) | Design an adder circuit using an op-amp to get the output expressions as $V_{out}= -(V_1+5V_2+25V_3)$, where $V_1$, $V_2$ and $V_3$ are the inputs. Given that $R_f$=50 kΩ. | (5) |
| 16 | | With the help of a neat diagram explain the operation of monostable multivibrator using 555 IC. | (10) |
| 17 | a) | Draw the circuit diagram and explain the working of a ramp generator using opamp. | (5) |
| | b) | Explain the effect of slew rate of opamp on waveform generation. | (5) |

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