

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  $\pm 10V$  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  $4k\Omega$  has a voltage gain of 200. If a series negative feedback with  $\beta=0.01$  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  $R_s$  of a zener voltage regulator circuit feeding a  $1k\Omega$  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  $R_f = 50 \text{ k}\Omega$ . (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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