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Pages: 2

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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