B

02000ECT202052101

Pages: 3

Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fourth Semester B.Tech Degree Examination July 2021 (2019 Scheme)

Course Code: ECT202
Course Name: ANALOG CIRCUITS

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks) Marks

1	Draw the amplitude and phase responses of an RC Low Pass Filter. Mark the cutoff frequency point on both. What is the phase difference at cutoff frequency?	3
2	Explain working of a self bias circuit?	3
3	Explain the hybrid-π parameters of BJT in CE configuration.	3
4	A CE amplifier with voltage divider biasing has V_{RE} =1.5V, V_{RC} =6V, V_{CC} =15V, I_{CQ}=3mA and β=200. Find R_1, R_2, Q-point.	3
5	Three stages of individual RC coupled amplifier having midband gain of 80 with lower cutoff frequency of 100Hz and upper cutoff frequency of 300MHz are cascaded. Find the resultant gain and cutoff frequencies.	3
6	Compare the small signal equivalent of MOSFET and BJT.	3
7	Inspite of reduction in gain, negative feedback is preferred for amplifiers. Justify the statement.	3
8	State Barkhausen criteria. How it is achieved in Wienbridge oscillators?	3
9	With the help of VI characteristics, explain foldback protection.	3
10	Why is class C amplifier highly efficient? Why are they not preferred in audio applications?	3

PART B

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

Module -1

11	a)	Design a high pass filter for a cutoff frequency of 5KHz. Plot the frequency response indicating roll off rate in terms of dB/decade and dB/octave. Also, draw output wave form for triangular input at i) 500Hz ii) 5KHz iii) 10KHz	8

	b)	Explain the concept of operating point with help of dc and ac load lines. Why is voltage divider biasing superior to other biasing circuits?	6
12	a)	Design a clamper circuit to clamp a $10V_{pp}$ sine wave so that its negative peak is clamped at +2V. Assume diode drop is 0.7V. Draw and explain the output waveform and transfer characteristics.	5
	b)	Derive the stability factor ($\partial Ic/\partial Ico$) of a voltage divider bias circuit.	9

Module -2

13	a)	Derive R_i, R_o, A_I and A_V using hybrid-pi parameters for CE configuration at low and mid frequencies.	10
	b)	Define f_T. How can it be measured?	4
14	a)	Design an RC coupled amplifier for a gain of 200, given that Vcc=15V and Ic =3.2mA and required input impedance is 1.44KΩ. Find the lower cutoff frequency of the amplifier. Assume capacitor values appropriately if necessary.	8
	b)	Draw the small signal high frequency CE model of a transistor and give the order of magnitudes of each capacitance and resistance.	6

Module -3

15	a)	Draw a CS MOSFET amplifier. With the help of small signal equivalent circuit, compute its voltage and current gains.	10
	b)	How can you increase the gain of this single stage without additional stages?	4
16	a)	How does cascode attain large bandwidth without compromising on voltage or current gains?	10
	b)	For a CS MOSFET amplifier, what is the input capacitance for the following conditions Cgs= 4pF, Cgd=1pF and Av=-5?	4

Module -4

17	a)	Derive the input resistance, output resistance and gain of voltage series feedback amplifier. Draw an example circuit and derive the same for the circuit from its equivalent circuit.	10
	b)	Design an oscillator to obtain sinusoidal waveform of 1MHz.	4
18	a)	Draw the equivalent circuit of a crystal. Explain crystal oscillator. Given the parameters of a crystal as Ls=0.8H, Cs= 0.08pF, Rs=5KΩ and Cp=1pF, determine the resonant frequencies.	8
	b)	How does negative feedback affect input and output impedances in feedback amplifiers?	6

Module -5

19	a)	What do you mean by harmonic distortion in a power amplifier? How is it reduced in a push-pull amplifier circuit?	6
	b)	Design a simple shunt regulator for an output voltage of 10V, when input varies from 14 to 24V and load current varies from 10mA to 40mA.Assume the Zener voltage stabilizes at a minimum current of 15 mA.	8
20	a)	A class-A series fed amplifier has $V_{CE(max)}$ =20V, $V_{CE(min)}$=5V, $I_{C(max)}$=8mA and $I_{C(min)}$=2mA. Determine the RMS value of current and voltage. Also determine the ac power and conversion efficiency given V_{CC}=25V and I_{CQ}=3mA.	9
	b)	What is crossover distortion? How can it be overcome and what compromise do we make in power amplifier performance?	5

***