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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester B.Tech Degree (S,FE) Examination January 2022 (2015 Scheme)

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 Derive an expression for the collector current I_C and V_{CE} in the case of collector to base biasing in CE amplifier with the circuit diagram and describe how operating point stabilization is provided by this biasing method. (5)

2 Draw a Source follower circuit using JFET and derive the expression for voltage gain. (5)

3 Define the terms collector efficiency and distortion in power amplifiers and determine the a). power rating of transistor b). maximum ac power output and c). maximum collector efficiency of a class A power amplifier having zero signal collector current of 150mA with collector supply voltage of 6V. (5)

4 Explain the principle of feedback in oscillators based on Barkhausen's criterion (5)

5 Draw the circuit diagrams for an op-amp used as a Zero crossing detector and as a voltage level detector. Show typical input and output waveforms (5)

6 Discuss in detail the operation of 3 input summing amplifier using op-amp with suitable diagrams and derive the equation for output voltage in terms of input voltage and circuit components. (5)

7 Design an astable multivibrator using 555 timer of frequency 200Hz and duty cycle of 70%. (5)

8 Draw and explain the working of a triangular wave generator using opamp. (5)

PART B

Answer any two full questions, each carries 10 marks.

9 a) With circuit diagram explain bias compensation using thermistor. (5)

b) For an N-channel JFET with a voltage divider biasing circuit has the following parameters, Vp= -3.8V and I_{DSS}=9mA, V_{DD}=17V, R_s=2kΩ, R_D=2kΩ, R_1=500kΩ and R_2=85kΩ. Calculate the drain current I_D and Drain Source VoltageV_{DS} (5)

10 a) A common emitter amplifier is driven by a voltage source of internal resistance R_s=500Ω. The load impedance is R_L=2000Ω. The h-parameters are h_{ie}=1200Ω, h_{re}=2.2x10^{-4}, h_{fe}=50 and h_{oe}=20μA/V. Determine the a). current gain A_i, b). input impedance Z_i c). Voltage gain A_v (5)

b) Draw voltage divider biasing circuit for a JFET and derive the expressions for operating point. (5)

11 a) With the help of neat diagrams explain the operation of N-channel depletion type MOSFET. (5)

b) Show that voltage divider biasing circuit is stable against temperature variations. (5)

PART C

Answer any two full questions, each carries 10 marks.

12 a) Draw the circuit of a transformer coupled transistor amplifier. Compare it with RC coupled amplifier. (5)

b) Draw the circuit diagram of a Colpitt's oscillator using BJT and derive the expression for frequency of oscillation. (5)

13 a) Draw the schematic of an amplifier with voltage series feedback and derive expression for closed loop voltage gain. (5)

b) Explain how a differential amplifier amplifies difference signal and rejects common mode signal. (5)

14 a) A Hartley oscillator using BJT is designed with two inductances L_1 and L_2, and their values are 15mH and 2mH respectively. The frequency is to be changed from 800kHz to 2000kHz. Calculate the range over which the capacitor is to be varied. Neglect mutual inductance (3)

b) In a RC phase shift oscillator, if R_1=R_2=R_3=250kΩ and C_1=C_2=C_3=150pF. Find the Frequency of oscillation (2)

c) Draw an ideal inverting op-amp with voltage shunt feedback and calculate the gain using virtual ground principle. (5)

PART D

Answer any two full questions, each carries 10 marks.

15 a) Draw the circuit diagram for an Instrumentation amplifier. Identify each section of the circuit and prove that the gain of the amplifier varies with the variable resistance. (5)

	b)	Explain the operation of square wave generator using op-amp with capacitor and draw the output voltage waveforms.	(5)
16	a)	With circuit diagram explain the operation of logarithmic amplifier.	(5)
	b)	How an opamp RC phase shift oscillator generates oscillations at a desired frequency?	(5)
17	a)	With waveforms explain the operation of an ideal integrator using op-amp.	(5)
	b)	Draw the internal diagram of 555 timer IC and explain the function of each components.	(5)

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