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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S, FE) / S2 (PT) (S, FE) / S4 (WP) (S) Examination December 2024 (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	Design a circuit to obtain square wave output from triangular wave input with 5kHz frequency.	3
2	In a fixed bias circuit R_B=560KΩ, R_C=3kΩ. Let V_{CC}=12V, βdc=100. Determine the value of operating point. Choose Si Transistor.	3
3	Define the small signal parameters g_m, r_e and r_π for a BJT amplifier.	3
4	Draw the dc and ac load line of RC coupled amplifier with bypass capacitor.	3
5	Compare BJT and MOSFET.	3
6	Discuss the common source MOSFET stage with diode-connected load.	3
7	Emitter follower is a Voltage series feedback amplifier. Justify the statement.	3
8	State and explain Barkhausen criteria for sustained oscillations	3
9	Compare various classes of Power amplifiers.	3
10	Discuss the principle of output current boosting in voltage regulator	3

PART B

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

Module -1

11	a)	Design a clamper circuit to get Vo=10Sin(1000t) -10V. Draw its i/p and o/p wave	7
	b)	What do you mean by thermal run away? How thermal stabilization is achieved in an RC coupled amplifier? Explain with neat sketches and equations.	7
12	a)	Design a filter such that lower cutoff frequency equal to zero and upper cutoff frequency equal to 5kHz.	7
	b)	Derive design equation of RC Differentiator. Show that output voltage is directly proportional to the derivative of input voltage.	7

Module -2

13 a) Draw the high frequency hybrid - π equivalent circuit of a CE Amplifier and derive the expression for mid band gain and upper cut off frequency 9

b) For an RC coupled amplifier with bypass capacitor, R_1=100 KΩ, R_2=20 KΩ, R_C=3 KΩ, R_E=1 KΩ and V_{CC}=12 V. The β of the transistor is very high. Calculate the mid band gain of the amplifier. 5

14 a) For a CE amplifier with potential divider bias, R_1=56 KΩ, R_2= 12.2 KΩ, R_C=2 KΩ, R_E=0.4 KΩ and supply voltage V_{CC}=10 V. The signal source has a source resistance of 0.5 KΩ and β of the transistor is given as 100. Calculate the small signal model parameters g_m, r_π and r_e and obtain the voltage gain, input impedance and output impedance of the amplifier. [A bypass capacitor is connected across the emitter resistor] 10

b) State and explain Miller's Theorem. 4

Module -3

15 a) Calculate the drain current and drain-to-source voltage of a common source circuit with an n-channel enhancement mode MOSFET. Given: R_1=22 KΩ, R_2= 10 KΩ, R_D=6.8 KΩ, V_{DD}= 8V, V_T=1 V, K_n= 0.1 mA/V^2. Also, calculate small signal voltage gain, input and output impedance. 8

b) Why is the bandwidth of a cascode amplifier large when compared to Common source amplifier? 6

16 a) Derive small signal voltage gain, input and output resistance of Common source amplifier with constant current source. 9

b) In an Enhancement MOSFET Voltage divider bias circuit threshold voltage (V_T)=2V and the drain current of 8$_{mA}$ at a gate source voltage of 6 V. Calculate the drain current for a Q- point defined by V_{GS}=4 V and V_{DS}=10 V. 5

Module -4

17 a) Explain the working of Wien bridge oscillator and derive feedback factor and frequency of oscillation. 9

b) Design a Hartley oscillator to generate 1MHz sine wave. 5

18 a) Explain any two effects of negative feedback on amplifier performance. 7

b) Determine the voltage gain, input and output resistance with feedback for voltage series feedback having A=-100, R_i=10KΩ and R_o=20KΩ for β=-0.10 7

Module -5

19	a)	Explain the working of Series voltage regulator. Deduce the expression for output voltage.	9
	b)	With necessary sketches, discuss the fold-back protection in series voltage regulator.	5
20	a)	Explain the working of a Transformer coupled Class A power amplifier and derive its maximum efficiency.	7
	b)	Supply voltage of Complementary Symmetry Class B push pull power amplifier is +12 and -12V. If R_L=8 Ω, Calculate the maximum input power, maximum output power and maximum efficiency.	7

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