Question Paper

Exam Date & Time: 01-Dec-2023 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.TECH. EXAMINATIONS - NOVEMBER/DECEMBER 2023
SUBJECT: ECE 1071 / ECE-1071 - BASIC ELECTRONICS

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

1A)	A silicon diode has reverse saturation current of 50 nA at 27°C. Determine the voltage required to get a forward current of 100 mA at 47°C. Also determine the static and dynamic resistances of the diode at 47°C.	(4)
1B)	A certain MOSFET has $\mu_n C_{ox}$ = 0.5 mA/V² and V_{Th} = 0.5 V. If the length of the channel is 180 nm, determine the width of the channel required to get the saturated drain current of 2 mA when V_{GS} = 1.5 V.	(3)
1C)	Draw the structure of n-channel MOSFET and explain its operation.	(3)
2A)	Consider a sinusoidal voltage of 200 sin (100πt) volts applied to a full wave rectifier with turns ratio 10:1. If the load resistance is 1kΩ, diodes are ideal, calculate. i) Average load current. ii) RMS load current iii) Efficiency & Ripple factor iv) Frequency of the output signal	(4)
2B)	Draw the circuit of Zener regulator and explain the principle of load and line regulation with respective equations.	(3)
2C)	In a Zener regulator, R_S = 120Ω, R_L =250Ω and V_Z = 5V. Find the minimum and maximum current flowing through Zener diode when input varies from 9V to 15V.	(3)
3A)	A (7, 4) bit Hamming code received is 1110111. Considering even parity, check for errors in the received code and if there is an error, write the corrected code. Also represent the transmitted data from the corrected code word.	(4)
3B)	Draw the circuit diagram of an OPAMP non-inverting amplifier and derive the expression for an output voltage. Given R_F=20kΩ, R_1=4kΩ and the dc supply voltage is ±12V. Calculate and plot the output voltage with respect to the input, if an input applied is 3sin (6284t) Volt.	(3)
3C)	Design an adder circuit using two OPAMP's to obtain: $V_{out}= 0.25V_1 +1.5V_2 - 0.5V_3$. Assume $R_F = 10k\Omega$.	(3)
4A)	Simplify the following logical expression using K-Map and implement using only basic gates: $f(A,B,C,D)= \sum m(1,4,7,10,13)+ \sum d(5,8,14,15)$	(4)
4B)	Explain the working of JK flip-flop with a neat logic diagram and truth table, using only NAND gates.	(3)
4C)	Draw the logic diagram of a 3-bit ripple up-counter using the negative edge-triggered JK flip flops. Plot the timing diagram for the same.	(3)
5A)	Define Amplitude Modulation (AM). Derive the time domain expression for AM wave and also plot the frequency spectrum.	(4)

5B)	Define Frequency Modulation (FM). A carrier of peak amplitude 6V and frequency 100MHz is frequency modulated by a sinusoidal voltage of peak amplitude 3V and frequency 5 KHz. If the frequency sensitivity is 10Hz/V, calculate the frequency deviation and modulation index. Write the equation for the resulting FM wave.	(3)
5C)	For the binary data 001101, sketch ASK, FSK and PSK signals.	(3)

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