Question Paper

Exam Date & Time: 02-May-2024 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

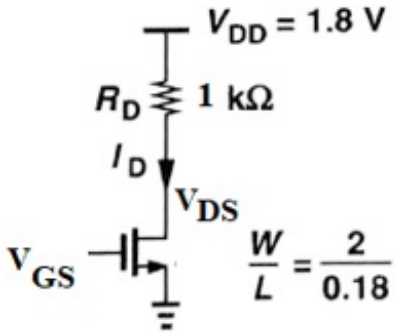
SECOND SEMESTER B.TECH. DEGREE EXAMINATIONS - APRIL / MAY 2024
SUBJECT: ECE 1071/ECE_1071-B/ECE 1051-B - BASIC ELECTRONICS

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

Answer all the questions.

Missing data may be suitably assumed.

1A)	Describe the operation of n-channel enhancement mode MOSFET along with V-I characteristics. Also derive the drain current of MOSFET in terms of V_{GS}, V_{DS}, and the dimension of the device.	(4)
1B)	A silicon diode has reverse saturation current of 15 nA at 25°C. Determine the voltage required to get a forward current of 6 mA at 35°C. Also determine the static and dynamic resistance of the diode at 40°C.	(3)
1C)	Explain Avalanche breakdown and Zener breakdown mechanisms in diode.	(3)
2A)	An AC voltage of 230V, 50Hz is applied to transformer having turns ratio 10:1. The secondary of the transformer is connected to half wave rectifier. The diode has cut-in voltage 0.6V and forward resistance 8Ω. If the load resistance is 400Ω, determine the average and rms values of output current and voltage. What should be the PIV rating of the diode.	(4)
2B)	For the Zener diode regulator shown, R_S = 10Ω, V_Z =10V, V_i = 25V. Find the minimum and maximum current through Zener diode when R_L is varied between 10Ω and 100Ω.	(3)
2C)	For the circuit shown below, determine the value of V_{GS} required to get V_{DS} = 1.3 V, if $\mu_n C_{ox}$ = 200 μA/V2 and V_{Th} = 0.4 V.	(3)



3A)	Design an adder circuit using two OPAMP's to obtain: $V_{out} = 0.5V_1 + 1.5V_2 - 0.5V_3 + V_4$. Assume $R_F = 10k\Omega$.	(4)
3B)	Draw the circuit diagram of an OPAMP non-inverting amplifier and derive the expression for the output voltage. Given $R_F = 10k\Omega$, $R_1 = 5k\Omega$ and the dc supply voltage is ±15V. Calculate and plot the output voltage with respect to the input, if an input applied is 2sin (6.28t) Volt.	(3)
3C)	A received (7, 4) Hamming code is 0010001. With even parity, check for errors and if there is an error, write the corrected code. Also represent the transmitted data.	(3)
4A)	Simplify the following logical expression using K-Map and implement using only NAND gates:	(4)

f(A, B,C,D)= ∑m(5,7,10,13)+ ∑d (2,15)

4B) Implement the logical function f(x, y, z) = ∑m (0, 3, 6, 7) using a 4:1 multiplexer. (3)

4C) Draw the logic diagram of a 3-bit ripple down counter using the negative edge-triggered JK flip flops. Plot the timing diagram for the same. (3)

5A) Given an FM Wave, S_{FM} (t) =15 cos [2 π 10^9t + 5 sin (2 π 20000t)]. (4)

Calculate:
i) Carrier frequency.
ii) Modulating frequency.
iii) Frequency deviation.
iv) Bandwidth using Carson's rule.

5B) For the given binary data 10011010, sketch ASK, FSK and PSK Signals. (3)

5C) Define the sampling theorem. What is the nyquist sampling rate of the signal (3)

$$x(t)=3\ cos(100\pi t) + 10\ sin(850\pi t) + 5\ cos(350\pi t).$$

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