Question Paper

Exam Date & Time: 29-May-2023 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER B.TECH. EXAMINATIONS - MAY/JUNE 2023
SUBJECT: ECE 1071-PHY/ECE 1071-B/ECE 1051-B - BASIC ELECTRONICS

Answer ALL questions.
Missing Data may be suitable assumed.

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

Answer all the questions.

1A)	With neat diagrams, explain the forward and reverse bias of PN junction diode with expressions for diode current and its temperature dependence.	(4)
1B)	If a silicon diode has reverse saturation current of 10 nA at 27° C, calculate the reverse current, forward current and dynamic resistance at 42° C when the diode is forward biased by 0.7 V.	(3)
1C)	Obtain an expression for the drain current of MOSFET in terms of 'VGS', 'VDS', and the dimension of the device. Also, plot the VI characteristics of the device indicating all the salient features on it.	(3)
2A)	A sinusoidal voltage of peak value Vi = 20 sin (2π 50t) V is applied to FWR. If the load resistance is 1KΩ. Calculate the average and RMS value of load current, efficiency and ripple factor.	(4)
2B)	A particular load must be supplied with 10mA average current at 5V dc voltage, the ripple factor not more than 10%. Calculate the value of the filter capacitor that needs to be connected to the output of the full wave bridge rectifier. Assume f=50Hz.	(3)
2C)	Draw the circuit of a Zener voltage regulator and label all the components. The Zener diode in a regulator circuit has a breakdown voltage of 15V and a power rating of 0.5W. If the input voltage applied is 40V, what is the minimum value of series resistance that prevents the Zener diode from being destroyed?	(3)
3A)	i) Represent $(0110)_2$ in the following codes. a) Excess 3 code b) Gray code c) Odd parity Hamming code. ii) Perform $(21.5)_{10}$ - $(12.25)_{10}$ using 1's complement method.	(4)
3B)	Draw the circuit diagram of an OPAMP inverting amplifier and derive the expression for the output voltage. Given R_1=2 kΩ, R_F=6 kΩ, and the dc supply voltage is +15V and -15V. Calculate and plot the output voltage with respect to the input, if the input applied is 2sin(2π50t) Volt.	(3)
3C)	Design the circuit using two OPAMPs to obtain $V_0 = 3V_1 - 6V_2 + 9V_3$. Assume R_F = 10 kΩ. Mention the values of the resistances required if the circuit must work as an adder.	(3)
4A)	Simplify the following logical expression using K-Map and implement using only Basic gates f(A,B,C,D)=Σm (0,1,10,11,12,15)+ Σd (4,8,14)	(4)
4B)	With a neat logic diagram and truth table, explain the working of SR flip-flop, implemented using only NAND gates. Mention the limitation of SR flip-flop.	(3)
4C)	Draw the logic diagram of a 3-bit positive edge triggered up-counter using T Flip-flops. Plot the timing diagram of the same.	(3)
5A)	Define AM. Derive the expression for the total power of AM in terms of carrier power and modulation index for a single-tone modulation.	(4)

5B)	Define Frequency modulation. A carrier of peak amplitude 5V and frequency 90MHz is frequency modulated by a sinusoidal voltage of peak amplitude 5V and frequency 10kHz. 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 binary data 10011, sketch the ASK, FSK and PSK signals.	(3)

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