Question Paper

MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.TECH. EXAMINATIONS - FEBRUARY/MARCH 2023
SUBJECT: ECE 1071 / ECE-1071 - BASIC ELECTRONICS
### (MAKEUP)

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

Answer all the questions.

1A)	A silicon diode has a reverse saturation current of 12nA at 20°C. i) Find diode current when it is forward biased by 0.65V. ii) Find the dynamic resistance offered by the diode at 20°C.	(4)
1B)	Draw V-I characteristics of the 'Si' diode. Explain the different types of breakdowns that can occur in a PN junction diode.	(3)
1C)	Calculate the bias current of M1 shown in the figure below. Assume $\mu_n Cox = 90\ \mu A/V^2$ and $V_{TH} = 0.5\ V$. If the gate voltage increases by 20 mV in Q1, what is the change in the drain voltage?	(3)
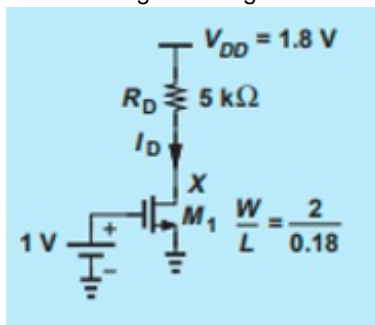
2A)	Draw the Zener voltage regulator circuit. A Zener diode has a breakdown voltage of 10V. It is supplied from a voltage source varying between 20V - 40V in series with a resistance of 820 ohm and load resistance of 1kΩ. Obtain the minimum and maximum Zener currents.	(4)
2B)	An AC supply of 230V, 50Hz is applied to a half wave rectifier circuit through a transformer with turns ratio 10:1. Determine (a) the output DC and RMS voltage (b) Efficiency and ripple factor. Given load resistance of 1kΩ connected across the circuit.	(3)
2C)	With a neat circuit diagram, explain the working of a center-tapped full wave rectifier. Draw the corresponding input and output waveforms.	(3)
3A)	A combinational logic circuit has four inputs A, B, C, and D, and one output F. The output F will be high only when two or more inputs are high and F will be zero otherwise. Obtain the truth table for F. Use Karnaugh map to find simplified SOP and implement the same using basic logic gates.	(4)
3B)	Derive an expression for the output of op-amp summing amplifier circuit with V_1 and V_2 as the inputs. Determine the resistor values to get an output $V_O = -(5V_2 + 3V_1)$ for this circuit. Assume $R_f = 10k\Omega$.	(3)
3C)	Derive an expression for inverting op-amp differentiator. Determine the output voltage for a sinewave input signal of 1V peak and draw its output waveform. Assume C=0.1µF and R=1.5kΩ.	(3)
4A)	Simplify the following SOP expression using K-Map and implement using basic gates only. F (A, B, C, D) = Σm(1,4,7,10,13)	(4)

4B)	Realise a 3-bit down counter using the negative edge-triggered JK flip-flops. Draw the timing diagram for the same.	(3)
4C)	Draw the circuit diagram of Serial-in Serial-out 4-bit shift register. Also, show the shifting of the data 1011 to the right using the data transfer table.	(3)
5A)	Define Amplitude modulation and sketch the amplitude modulated wave for a sine wave modulating signal. A Certain AM transmitter radiates 9kW of power with carrier unmodulated and 10.125kW of power when the carrier is sinusoidally modulated. Calculate the modulation index.	(4)
5B)	For the binary data 10110, sketch the ASK, FSK, and PSK signals.	(3)
5C)	Draw the block diagram of the Communication System and explain the function of each block.	(3)

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