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MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.TECH. EXAMINATIONS – FEBRUARY-MARCH 2022

SUBJECT : ECE 1051/ECE_1051: BASIC ELECTRONICS (DTQ)

Monday, February 28, 2022

Time: 10:30 – 12:10 Hrs.   Maximum Marks: 40

PART - B

1A. Sketch the V-I Characteristics of a PN junction diode. Calculate the dynamic forward and reverse resistances of PN junction Germanium diode at a temperature of 300K, when the applied voltage is 0.25V and reverse saturation current is 10 µA.

1B. A particular load has to be supplied with an average power of 50mW, 5V dc voltage. Find the value of capacitance and transformer turns ratio in a half wave rectifier with capacitor filter such that the ripple factor should not exceed 1%. Assume 220V rms, 50Hz supply voltage. Also, sketch the voltage waveform across the load.

(5+5 = 10 Marks)

2A. Sketch the frequency response of RC Coupled amplifier that gives an output voltage of 1V for an input voltage of 100mV in the mid band frequency range and allows the signals of frequency range 300Hz to 3.4KHz. Consider a transistor in which 99% of the carriers injected into the base cross to the collector region. If collector current is 4mA and collector to base leakage current is 6µA, Calculate emitter and base currents.

2B. Realize the equation $V_{OUT} = 3V_1 - 2V_2 + 0.5V_3$ using two OP-AMPS, where V_1, V_2, V_3 are the input voltages and V_{OUT} is the output voltage.

(5+5 = 10 Marks)

3A. Draw the truth table for the 3- bit full adder with sum and carry expressions. Simplify the sum and carry expression using k-map and realize using only NAND gates.

3B. Define frequency modulation. Consider a FM signal given by equation
$V_{FM}(t) = 5 \cos [2 \times 10^8 \pi t + 3 \sin (40000 \pi t)]$. Calculate carrier frequency, modulating frequency, frequency deviation and bandwidth.

(5+5 = 10 Marks)

4A. For the circuit shown in the **FIG.Q4A**, sketch the output characteristics and mark the operating point. Assume Silicon transistor with β=100.

4B. With a neat logic diagram and shifting table, explain the shifting of given bit stream 1011001 entered from LSB in serial –in-serial-out 4 bit shift right register. Also mention after how many clock pulses, MSB is retrieved?

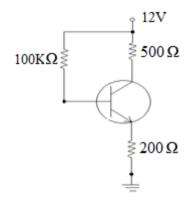4C. Draw a neat block diagram of basic digital communication system and explain the function performed by each block.

FIG.Q4A

(4+3+3 = 10 Marks)

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