SECOND SEMESTER B.TECH. (E & C) DEGREE END SEMESTER EXAMINATION
JUNE 2019
SUBJECT: BASIC ELECTRONICS (ECE - 1051)

TIME: 3 HOURS   **MAX. MARKS: 50**

Instructions to candidates
- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. Draw the self -bias circuit using n-p-n transistor. If R_1=10kΩ, R_2=1kΩ, V_{CC}=15V, I_C=3.12mA, V_{BE} =0.7V and β=100, Calculate i) R_E ii) Base voltage V_B

1B. Draw the input and output characteristics of n-p-n transistor in CE configuration indicating the different regions of operation. Also, explain the Early effect.

1C. With neat diagrams explain how transistor is used as LED driver and inverter.

(4+3+3)

2A. A Zener voltage regulator needs to maintain an output voltage of 20 V across a 1k Ω load with an input that will vary between 30 and 50 V. Determine the proper value of R_S and the maximum current I_{ZMax}

2B. With neat input and output waveforms draw the circuit diagram of full wave bridge rectifier and explain the operation.

2C. Realize each of the following equations using single OPAMP.
(i) Vo = 2V_1 (ii) Vo = - (5V_1 + 2V_2) where V_1 and V_2 are the inputs.

(4+3+3)

3A. Simplify the following using K-Map and implement using only NAND gates.
F (A, B, C, D) = ∑ m (0, 2, 5, 10, 11, 15) + ∑ d (7, 8, 14)

3B. Realize a 3 bit asynchronous up counter using -ve edge triggered JK flip-flops. Also draw the timing diagram of each flip-flop output.

3C. Write down the truth table of a full adder circuit. Obtain the expression for Sum and Carry$_{out}$ of a full adder. Implement a full adder using two half adders and an additional gate.

(4+3+3)

4A. Consider a FM wave given by the expression $V = 10 \, cos[2\pi 10^6 t + 0.1 \, sin \, 10^3 \pi t]$ with frequency sensitivity 5Hz/volt. Find the carrier frequency, modulation index, maximum frequency deviation, bandwidth, modulating frequency and amplitude.

4B. Derive an expression for FM signal in time domain. Mention any four differences between AM and FM.

4C. Consider an AM modulated wave with the message signal $m(t) = 10cos(2\pi 50t)$, carrier signal $c(t) = 50cos(2\pi 10^5 t)$. Find modulation index, sideband frequencies, bandwidth, total power delivered if R_L=1KΩ, amplitude of each sideband component.

(4+3+3)

5A. With a neat block diagram explain the function of each block in a digital communication system.

5B. Highlight the function of three basic multiple access methods.

5C. Highlight the function of following terms with reference to electronic communication systems:
i) BTS ii) NSS iii) HLR

(4+3+3)