May 2019

B.Sc. (Physics)-4th Semester

DIGITAL SYSTEMS AND APPLICATIONS

(BPH 403)

Time : 3 Hours]   [Max. Marks : 75

Instructions :

(i) It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.

(ii) Answer any four questions from Part-B in detail.

(iii) Different sub-parts of a question are to be attempted adjacent to each other.

PART–A

1.   (a)   Write the decimal equivalent of the binary number 1010010.   (1.5)

      (b)   Find the difference between 43 and 32 using 2's compliment.   (1.5)

      (c)   If an OR gate has four inputs and one input is high and other three are low. What is the output?   (1.5)

(d) How to obtain symmetrical waveform in Astable multivibrator? (1.5)

(e) What is the basic storage element in digital circuits? (1.5)

(f) Why is a hexadecimal number system called as an alpha numeric number system? (1.5)

(g) Prove that $(A + B)(\bar{A} + B)\bar{B} = 0$. (1.5)

(h) What is the importance of SiO_2 during the IC fabrication? (1.5)

(i) How many AND, OR and EXOR gates are required for the configuration of full adder? (1.5)

(j) What is clock frequency of 8085 microprocessor? (1.5)

PART–B

2. (a) Design a circuit that counts the number of 1's present in 3 inputs A, B and C. Its output is a two-bit number X_1 X_0, representing that count in binary. Assume active-HIGH logic. (i) Write the truth table for this circuit. (ii) Find the minimized logic equations for outputs X_1 and X_0 using a K-map. (10)

(b) Design a 3-bit binary synchronous down-counter using J-K flip-flops. (5)

3. (a) Implement the function $F = (AB+A'B')(CD' + C'D)$ using (i) NAND gates (ii) NOR gates. (5)

(b) Simplify the following Boolean function using 4-variable map

$F (w, x, y, z) = \Sigma (2, 3, 10, 11, 12, 13, 14, 15)$. (5)

(c) Show how to make a 2-input NAND out of 2-input NOR gates. (5)

4. (a) Write the advantage of EPROM over PROM. (5)

(b) Astable multivibrator operating at 150 Hz has a discharge time of 2.5 m. Find the duty cycle of the circuit. (5)

(c) Determine the time period of a monostable 555 multivibrator. (5)

5. (a) Differentiate between Combinational & Sequential Circuits. (5)

(b) Design a 4 bit shift register in parallel in serial out mode. (10)

6. (a) What are the advantages of ion implantation technique in comparison to diffusion? (5)

(b) What are the basic processes involved in fabricating ICs using planar technology? Briefly explain every step. (10)

7. (a) What are the different Flags in 8085 microprocessor?

(5)

(b) Draw the block diagram of 8085 microprocessor and explain the working of every component. (10)

———————