020306

December 2023

B.Tech. (Robotics and AI) - III SEMESTER

Digital Electronics

(PCC–RAI–304)

Time : 3 Hours]   [Max. Marks : 75

Instructions :

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

2. *Answer any four questions from Part-B in detail.*

3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) How can a XOR gate be converted into a NOT gate?
   (1.5)

   (b) Why digital IC's are better to use? (1.5)

   (c) Which code is used to solve the K-Map and why?
   (1.5)

(b) Enumerate the blocks involved in the conversion process of analog data to digital data. (5)

7. Write short notes on :

   (i) CPLD.

   (ii) CAM.

   (iii) FPGA. (15)

(d) Why do we say that don't cares are to be used for clubbing the combinations in K-map? (1.5)

(e) Why the concept of look ahead carry is important and where it is used? (1.5)

(f) Compare sequential circuits with combinational circuits. (1.5)

(g) Compare latch and flip flop. (1.5)

(h) Which is the fastest A/D converter and why? (1.5)

(i) Where do we specifically use CPLD's? (1.5)

(j) What is the basic principle of charge coupled devices? (1.5)

PART–B

2. (a) Realize all basic gates with the help of diodes and transistors. Also realize them with the help of only NOR gates. (10)

(b) Subtract the following with the help of two's complement method :

(i) 34–67

(ii) 153–48 (5)

3. (a) Realize the following with the help of 8:1 multiplexer.
   $F(a, b, c, d) = \Sigma m(1, 3, 4, 6, 8, 9, 11, 12, 13)$ (5)

(b) Explain the following :

(i) Why do we require Carry look ahead adder? Explain its working. Also explain that what will happen if we don't consider the concept in adders?

(ii) Realize parallel adder and subtractor in a single circuit. (10)

4. Explain the following :

(i) A code needs to be send over the communication channel. Prepare its Hammings code to be sent. The code to be sent is 011010.

(ii) How can we remove the toggling condition of JK flip flop? Draw its circuit and explain the remedial action.

(15)

5. (a) Design a Mod–6 synchronous counter. (5)

(b) Draw a circuit for right and left shift register in single circuit and explain how PIPO, PISO, SISO and SIPO operations can be carried out in it. (10)

6. (a) Explain the process of Successive Approximation and then explain the bloc diagram of SAR A/D conversion along with the benefits of use of digital data over analog data processing. (10)